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ALTERNATIVE MODELS FOR INDIVIDUALIZED ARMOR TRAINING

Richard K. Matlick and Kenneth I. Epstein
Litton Mellonics Systems Development Division

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
    This report presents alternative generic models for the individualization
of Armor training, along with a scheme for the classification and description
of the instructional environments (contexts) of Armor training and a procedure
for selecting alternative models for those environments and incorporating
Instructional System Development (ISD) procedures.

    The classification scheme describes the contexts of instruction in terms
of three fundamental dimensions: setting, focus of instruction, and time

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Item 20 (continued)

boundaries. Each context class is described in terms of the eight factors treated in the review and analysis of the literature: time available, instructional personnel, facilities, management, student population characteristics, course content/task types, instructional methods, and media/ materials/devices. The sixteen alternative models of individualized instruction are built on four fundamental variables: instructional treatment, required proficiency, learning objectives, and time boundaries. Finally, the descriptions of context classes identify certain links between the context classes and the alternative models of individualized instruction.
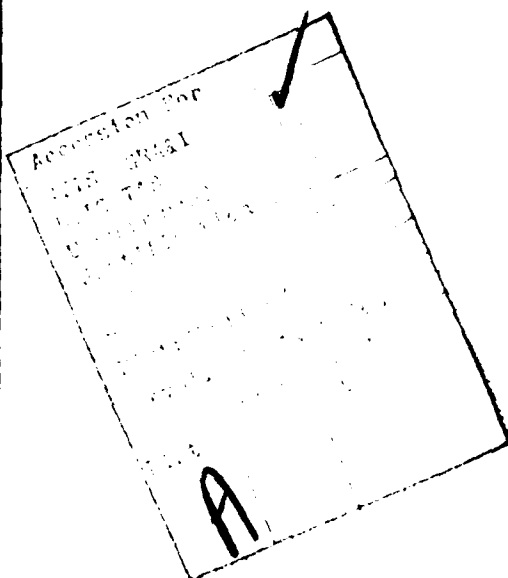
Technical Report 465

ALTERNATIVE MODELS FOR INDIVIDUALIZED ARMOR TRAINING

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Army Project Number
2Q162722A777

Individual Training Technology

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FOREWORD

The US Army Research Institute for the Behavioral and Social Sciences (ARI) has had a continuing program of research responsive to the training development needs of the combat arms. Increasing sophistication of Armor weapon systems coupled with a drive to maximize the efficiency of Armor training have led to a search for training innovations.

The Armor community has recognized the potential value of training management and delivery systems in the general category of individualized (or self-paced) instruction. Initial attempts to develop individualized programs of instruction in Armor have taken place for Turret Mechanic and Track Vehicle Mechanic MOS. Both of these efforts were hampered by the lack of a family of clear conceptual models to follow.

This report presents alternative models for the individualization of Armor training, along with a scheme for classifying and describing the instructional environments of Armor training and a procedure for selecting alternative models for those environments.

This research was responsive to Army Project 2Q162722A777, Individual Training Technology, and will provide part of the technology base from which to develop specific programs of individualized instruction in the Army.

JOSEPH ZEIDNER
Technical Director

BRIEF

Requirement:

To increase the effectiveness of performance-based training by individualizing Army instruction according to an appropriate selection of the most effective training model, this research classifies alternative models and presents a system for selecting the most suitable model for a given situation.

Model Development:

First, the instructional environments (contexts) were classified into 24 context classes and defined in terms of three fundamental dimensions: the setting and focus of instruction and the time boundaries. Eight factors influence or control the nature of instruction within any context: (1) time available for learning, (2) instructional personnel, (3) facilities for instruction, (4) management capability, (5) learner characteristics, (6) course content or task types, (7) instructional methods, and (8) the instructional media, materials, and devices. An individualized instruction system designed to meet the needs of an entire context class would be usable for any specific training activity whose context is included within that class.

Next, general models of individualized instruction systems, with discernible relationships to the constraints of the context classes, were built on the fundamental training variables—instructional treatment, required student proficiency, instructional objectives (content), and time available for learning, each of which may be fixed or variable. The constraints of a given context class identify which general model of instruction system is most suitable and guide further development of individualized instruction.

Utilization:

These procedures may be used, in conjunction with the Instructional System Development (ISD) procedures, to develop systems of individualized instruction for Armor training. With slight modifications, they may be employed for the individualization of Army training in general.

ALTERNATIVE MODELS FOR INDIVIDUALIZED ARMOR TRAINING

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INTRODUCTION

In a review of the literature of individualized instruction, Matlick <u>et al.</u> (1979) addressed the need to develop "rational and systematic procedures for selecting ways to individualize within particular instructional contexts" (p. 110, 111). This report presents such procedures, which begin by classifying and describing the contexts of instruction and then proceed to the identification of models of individualized instruction that are appropriate for the various classes of contexts.

The procedures described must be considered theoretical. They draw heavily on accumulated experience with individualized instruction, of course, as well as on theoretical constructs, but whether they will result in the selection of a feasible and effective form of individualized instruction for any given context of instruction is an empirical question. And this same caveat can be said to have applied also to the Instructional System Development (ISD) procedures in their early stages of development. The ISD procedures have resulted in the development of effective instructional systems -- if for no other reason than that they cause the developer to systematically consider each step of the design of instruction -- but at their inception they must have been regarded as essentially a theoretical construct whose validity would be determined empirically. This is not to say that the bits and pieces of the ISD procedures had not gotten beyond the theoretical stage. The various aspects of the ISD procedures when they were developed represented the state of the art in such matters as task analysis and media selection, to mention only two examples, but the procedures themselves as a means of arriving at a coherent and effective system of instruction had to be considered a theoretical construct. So it is with the context-classification-and-model-selection procedures described here: many of the bits and pieces have been subjected to a great deal of empirical validation, but the procedures themselves, as a means of getting from the perception of a particular context of instruction to a model of individualized instruction that is feasible and effective for that context, must be viewed as theoretical until they also, as a functional whole, have been empirically validated.

Furthermore -- and not at all incidentally -- these procedures are consistent with, and perhaps complementary to, the ISD procedures. The ISD procedures also treat individualized instruction, of course, but only in a molecular way. That is, they identify the features of individualized instruction and draw the developer's attention to them, but they do not necessarily lead to a consideration of whole systems or models as feasible alternatives, that is, to a molar view of various approaches to individualized instruction. The procedures described here, however, do provide that molar view. Instead of offering the developer a catalog of the various features of individualized instruction which can be assembled into a <u>system</u> (a unity) of individualized instruction, they offer models that need only to be fleshed out with specific content in order to become systems. In this sense, then, the procedures described complement the ISD procedures.

Two concepts -- those identified by the terms "context" and "model" -- are pivotal to the discussion that follows and thus need to be defined. The <u>context</u> of instruction is the total environment of any given instructional

undertaking. That instructional undertaking may be a whole course -- or even a whole program -- of instruction, but it may also be only a lesson or even a single instructional objective. If, for example, the total environment or context of a six-weeks course in, say, tactics were not to change in any significant way for the whole six weeks (that is to say, if the setting did not change, if the length, frequency, and number of instructional periods did not change, and so on) then the whole course could be thought of as having taken place within a single context or environment. But if, in mid-course, the setting of instruction should change, then the total environment or context would be changed. Likewise, if the time factor were to change in some significant way -- say, from three 50-minute periods a week to two 75-minute periods or to one 150-minute period -- then again the total environment (context) would be changed because instruction cannot be carried on in one or two long periods exactly as it would be in three equivalent but shorter periods.

A model of instruction (in the case addressed in this volume, a model of individualized instruction) is a representation of a whole arrangement for an approach to instruction. In a sense, it is a system of instruction stripped of content so that it may be regarded without concern for particular content. Conversely, it is a framework for instruction that needs only content in order to become an instructional system, that is, an instructional system in the abstract. Such a model will be defined by fundamental dimensions, such as the nature of the learning objectives, the criteria to be attained, the nature of the instructional treatment, the time boundaries, and perhaps others, and it will describe the path of the learner through the instruction, the controls on the learner, and a number of other particulars of instructional arrangements. In science in general, a model is a simplified representation of a complex reality, and that is exactly the sense in which the term is used here. Within any real instructional activity, with many students involved in learning, with instructors involved in the management of their learning, with a plethora of materials and devices, there are far too many events, variables, and paths to be discerned or even conceived of by any one observer in any one instance, but the direction and purpose of the activity can be inferred if not directly apprehended, and to the extent that it is systematic (as opposed to spontaneous) it can -- piece by piece -- be captured in definitions, descriptions, and diagrams. The models, then, are definitions, descriptions, and diagrams of actual or possible instructional activities.

The Methods of the Study

This study has more in common with training development than with behavioral research; that is, it is focused on instruction rather than on learning, a seemingly fine but nonetheless necessary distinction. Learning, of course, or the lack of it, will provide the ultimate test of the products of the study, but the study nonetheless is concerned principally with the devising of instruction as a means of learning and only indirectly with the nature of learning itself. That is to say that this study is in the province of educational technology.

Many authors -- Hilgard and Bower (1966, p. 542) among them -- have commented on the enormous difficulty of getting from the psychology-of-learning laboratory to the classroom, and that problem does not need to be dealt with here. Educational technology is an aspect of the bridge from laboratory to

classroom, of course, but this study is not directly concerned with that bridge. It is concerned with establishing a bridge from one instance of instruction in which the technology of instruction has been successfully applied to another instance in which an effective technology is needed. Looking at a number of successful instances of instruction, how does one decide which are models to be emulated in another instance or, to be even more eclectic, which specific technological applications or features should be emulated or replicated? This decision would seem to require a technique. The essential purpose of this study, then, is to develop a technique, one which may become another tool of educational technology. One method of the study may therefore be said to be invention.

The other methods of the study are more traditional. A thorough review of the literature of individualized instruction (Matlick et al., 1979), through all standard sources of scientific and technical information, has established the foundation of the study, and the documentation of that review, in terms of the number of pages at least, constitutes the dominant product. The administration of interviews and questionnaires and informal observations by researchers, as means of gathering data to both test the validity of the technique presented here and guide its development, constitute the other principal methods of the study.

The Collection of Validation Data

While both the context classification system and the analysis of contexts classified through that system are to be considered theoretical constructs whose validity must be determined empirically within the instructional development process, it was considered necessary to assess the reasonableness and usefulness of these constructs early in their development. Even though the purpose of these constructs is to establish a basis for discriminating among the various instructional environments (contexts of instruction) so that feasible and appropriate models of individualized instruction may be selected for them, the approach to this preliminary validation was to take the tentative classification system and the approach to the analysis of contexts directly to training implementers for comments. Training developers and training implementers are usually not the same persons, of course, and training developers are the intended users of the context-classification-and-model-selection procedures, but training implementers will be the principal judges of the validity of those procedures. If the procedures do not result in the selection of feasible and appropriate models of individualized instruction, the training implementers will be the first to know. Furthermore, training implementers know the environments of instruction most intimately and should be able to provide a preliminary judgment of the validity of procedures intended to classify and describe those environments (contexts).

The procedure for the collection of validation data from training implementers included interviews, questionnaires, and direct observations by a researcher (the principal investigator of the research project). Because the researchers were, at the beginning, not sure of how the idea of context classification and analysis should be broached or of what questions should be asked, it was decided that data collection would begin with informal, unstructured

interviews and then proceed to more formal, structured interviews, question-naires, and observations as the questions relevant to the issue of validity emerged. The intent was, thus, to try out the tentative context-classification-and-analysis system on a population of training implementers (at the Armor School), to revise it or develop a new one in response to the ensuing discussions, and then to structure data-collection instruments on the basis of the revised or newly developed system. Data collection would then proceed to a second phase (with visits to Armor units) in which appropriate questions and observations would test the validity of a system that training implementers had already been involved in shaping. The result of this effort was to be a pool of data that could be used to test, direct, and constrain the evolution of the context-classification-and-model-selection procedures in the later stages of the study.

Very early in the study a tentative context classification system and an approach to context analysis had been developed and partially documented. This partial documentation became the starting point of the first, informal, unstructured interviews with some training implementers. The interviewer (the principal investigator) had previously examined (i.e., classified and analyzed) some hypothetical contexts on the basis of the tentative classification system and approach to analysis and found that these did result in some important discriminations among contexts. Thus, early in these initial interviews he described these hypothetical contexts to the interviewees to determine if they intuitively (i.e., without reference to the classification system) felt that there were significant differences among the hypothetical contexts described.

Three hypothetical contexts were described as follows:

o Sergeant Brown at Fort Knox has a shop (a classroom) in which
   he teaches automative maintenance. He has 10 hours to teach an
   AIT (Advanced Individual Training) module. He has the equipment
   he needs, including parts of tanks, devices, simulators, etc.

o Sergeant Jones at Fort Hood has a shop (a classroom) in which
   he teaches automative maintenance. He has the equipment he
   needs, including parts of tanks, devices, simulators, etc. He
   also teaches an AIT module, but he does not worry about time;
   if he needs 20 hours to complete his module, he can get 20 hours.

o Sergeant Williams at Fort Carson has a classroom in which he
   teaches gunnery. He has GTAs (graphic training aids), devices,
   and other training aids. He has 20 hours to teach an AIT
   module, no more.

The training implementers participating in the informal, unstructured interviews (the first two interviews) immediately and unanimously saw that the first two training environments above were different in terms of their time boundaries; i.e., one was bounded by fixed time and the other by variable time. They believed that this difference was significant in terms of the process of instruction. They also saw, although less quickly, that the third environment (context) was different from the first two in that the tasks being taught were more mental (cognitive) than those in the first two. This difference, too, they believed, made a difference in terms of the process of instruction.

The dimension of setting is constant in the three hypothetical environments or contexts given above (that is, it is instructional-indoor in each case), but when the interviewees saw the three-dimensional matrix used to illustrate the classification scheme (essentially the same as the one given in Figure 1), they agreed that it described the concept that had been discussed. That is, they agreed that it seemed reasonable to discriminate, or classify, instructional contexts on the basis of the three general dimensions of instructional setting, focus of instruction, and time boundaries. In various ways, however, they did express the idea that other issues would have to be considered in developing a precise description of a context of instruction. They seemed to believe, for example, that the skill of the NCO-instructors usually found in a given context would make a considerable difference in the nature of the context.

The discussion then moved on to the factors that within any given context appear to strongly influence the process of instruction. A tentative list had already been drawn up, and it was given to the interviewees. The list contained the following factors:

o time available
o instructional personnel
o facilities
o management capability
o task type
o learner characteristics
o feasible methods
o available instructional resources

Each factor was discussed in turn, and the interviewees noted that most of them could be resolved into a set of sub-factors. The time available for learning, for example, would not only be of a certain amount (even for self-pacing) but would also be available in certain units, such as an hour, a half day, or a full day at a time. These units of time would also be available at a certain frequency, such as all at once (one solid block of time) or daily, or three times a week, and so on. As a further example, the instructional personnel factor could also be resolved into several sub-factors: it could be useful to know whether the NCO-instructors were skilled in their MOSs, whether they had been trained as instructors, and how many students there were for each instructor.

After each factor had been discussed and it had been generally agreed that each of these factors did influence the process of instruction, and probably in a different way or to different degrees in different contexts, the interviewees were invited to delete from the list factors which did not seem very influential or important and to add new ones which did. There were no such changes, but the interviewees did maintain that it would be important to discover each sub-factor.

After only two unstructured, informal, exploratory interviews (one with an individual and the other with a group of trainers), the understanding of and agreement with the scheme for the classification and analysis of the contexts of instruction was so complete that there seemed to be no reason not to structure subsequent interviews along the lines established during the first two, and this was in fact done. It was also decided that a questionnaire would
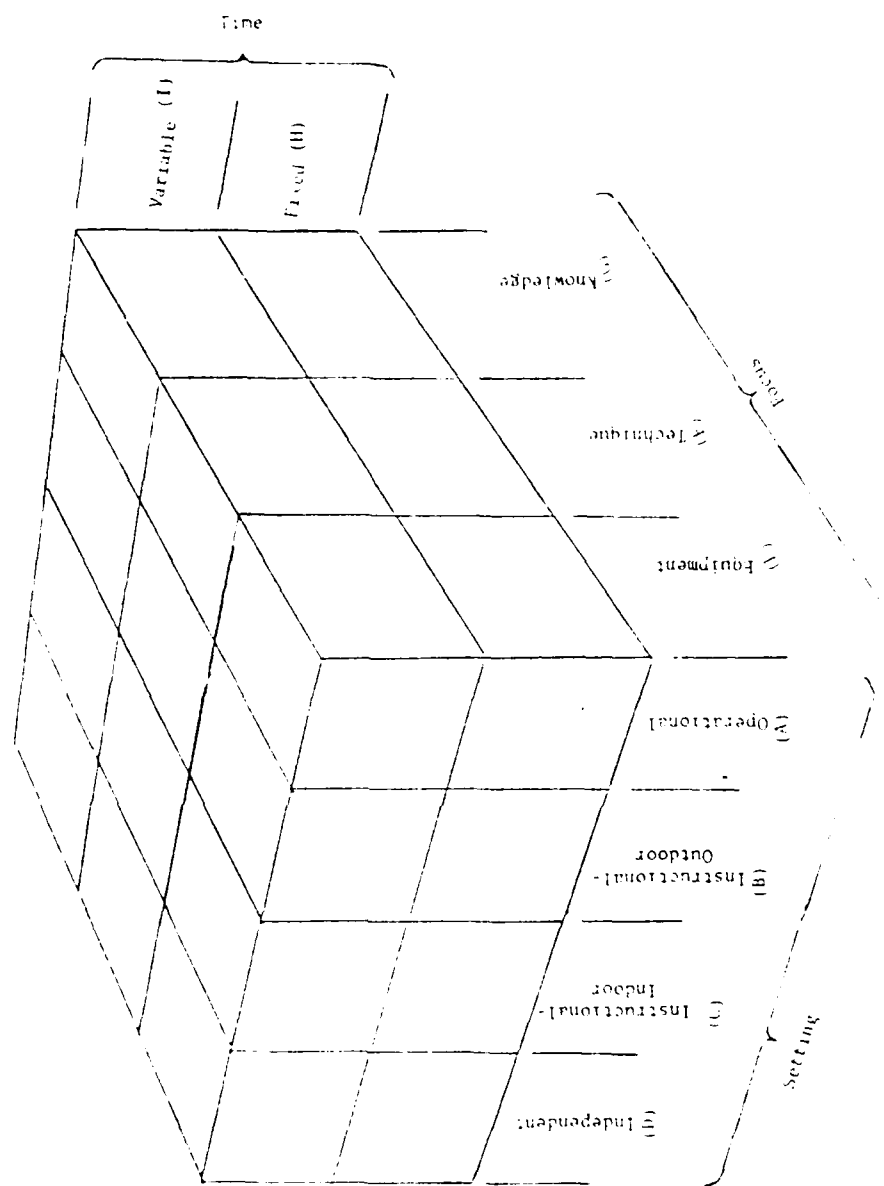
Figure 1. Classification Matrix.

be developed to attempt an identification of all sub-factors. It would be administered to the persons in each group of subsequent interviewees who seemed best qualified to describe a particular context. The structured interview and observation instruments are included as Appendix C and the questionnaire as Appendix D.

The interviewer had expected a considerable amount of dissent or confusion in these initial discussions, and this dissent or confusion was to drive the revision or reformulation of the context classification and analysis scheme. But there was no dissent or confusion; nearly all interviewees -- both those in the initial interviews and those that followed -- thought that the scheme was an understandable and appropriate way to make distinctions among contexts or environments of instruction. They seemed to see that the structure of it was essentially arbitrary but suggested no alternative way of systematically making distinctions or discriminations.

The schedule of data collection activities is shown in Table 1. The detailed results of interviews, the administration of questionnaires, and informal observations of instructional contexts are included here as Appendix A and Appendix B. Generally, the data of observations only confirmed data from other sources, but in several cases they were entered in the tables of Appendix A.

Table 1. Data Collection Schedule

Date (1979)	Data Collection Activities	Interviewees
14 May	Unstructured (exploratory) interviews	Civilian instructor of Weapons Depts, USAARMC; S-3 and 3 senior NCOs of 1st Training Brigade at Fort Knox
15 May	Discussion of purpose and general methods of research project. (informant interview)	Deputy Assistant Commandant for Educational Technology, USAARMC
15-17 May	Structured interviews and informal observations	Six (6) instructors of Maintenance Dept., USAARMC; six (6) instructors of Basic Noncommissioned Officers' Course (BNCOC), including SGM in charge; two (2) instructors and one training manager of 1st Training Brigade (OSUT/AIT) at Fort Knox; and two (2) instructors (gunnery) of Weapons Dept., USAARMC
17 May	Discussion of purpose and general methods of research project (informant interview)	Chairman of Weapons Dept., USAARMC
19-21 May	Structured interviews, administration of questionnaires, and informal observations	S-3 and several senior NCOs (instructors) of each of three divisional Armor battalions, Fort Carson
25-27 June	Structured interviews, administration of questionnaires, and informal observations	S-3 and several senior NCOs (instructors) of each of three divisional Armor battalions, Fort Hood.

Chapter II

CLASSIFICATION OF THE CONTEXTS OF INSTRUCTION

It is readily apparent that the contexts of instruction differ from each other in a variety of ways. It is clear, for example, that instruction going on in a classroom is contextually, environmentally, different from instruction being conducted in, say, an outdoor training area. Some of the differences are obvious -- the activities in the classroom are not constrained by weather conditions or by the time of night or day -- but some may be quite subtle. The extraneous sensory inputs from the outdoor setting may be much greater than those in the indoor setting and may, in fact, be more than the instructional stimuli can overcome. Because of the sheer physical distance of the activity from the locus of managerial control, the time boundaries of the context with an outdoor setting, whether actually fixed or variable, may be more elastic and thus less constraining to the process of instruction than the time boundaries of the context with an indoor setting. In the context with an outdoor setting students may be seen with their hands on some piece of equipment and with procedural (that is, step-by-step) guidance of some sort nearby; in a context with an indoor setting the nature of the learning may be far less observable as learners simply look intently at an instructional presentation, whether a book or manual or an instructor on a platform.

Because of these readily apparent differences among the contexts of instruction, it is only slightly less apparent that an approach to instruction that is effective in one context may not be satisfactory in another. Instructional mediation through electrically driven or fragile devices, for example, probably would not be reasonable in a context with an outdoor setting. It would therefore seem to be important to be able to discriminate among the *various contexts of instruction on the basis* of variables that can predict which approaches would or would not be feasible and satisfactory within a given context. This need suggests a system of classification -- a taxonomy -- constructed of such variables. Ideally, such a taxonomy would involve descriptive bases that are exhaustive, mutually exclusive, and logically satisfying, but in the absence of the conceptual illumination that would provide such a system of classification, any system that permits the discrimination of instructional contexts on the basis of variables that make a difference in the effectiveness, appropriateness, or feasibility of approaches to instruction would be satisfactory, at least tentatively. It may be that such a taxonomy would not recognize or sort out all significant variables, but if it resulted in the codification of most and a determination of the strength of their influences on the process of instruction, then its usefulness could be demonstrated, and revisions to capture all significant variables would become inevitable.

The Proposed Classification System

The system of classification proposed here (already discussed in Matlick et al., 1979; see pp. 2-5) defines the contexts of instruction in terms of the setting of instruction, the focus of instruction, and the time boundaries. Thus, it is represented by a three-dimensional matrix. See Figure 1.

Each dimension contains two or more categories, and each category comprises a number of attributes:

Setting includes the following categories:*

    o Operational. An operational setting is one in which
       Armor tasks are performed by teams (crews) or by
       individuals under conditions prescribed for those
       tasks. While the training of units is the explicit
       purpose of the activities within a context including
       this setting, the training of individuals is also at
       least implicit and is not necessarily precluded. For
       different individuals at different times, there are
       lulls in operations that provide time for individual
       learning. The problem is simply one of devising
       means of individual learning that are capable of taking
       advantage of such opportunities as present themselves.
       Some factors operating in contexts which include the
       operational setting can be expected to be constraining
       (time available for learning, for example, and facilities)
       but others can be expected to favorably influence efforts
       at individualized instruction (for example, a large
       number of potential instructors in the persons of small-
       unit leaders and probably motivated soldiers).

    o Instructional-outdoor. An instructional-outdoor setting
       is one designed specifically for instruction but without
       protection from the elements. The teaching/learning
       activities found in contexts that include this setting
       may be of such a nature that instruction in a con-
       text including an indoor setting would not be feasi-
       ble or suitable, but absent or inadequate indoor
       facilities appear to be an equally likely rationale
       for the outdoor setting. Within contexts of which
       this setting is a dimension the facilities factor is
       likely to be constraining in the sense that many
       media and training devices will be neither available
       nor useable. The management factor may also be some-
       what constraining in contexts including this setting
       because of the difficulties that attend the admini-
       stration of paper-and-pencil tests and the use of
       student records. But most other factors suggest a
       positive influence. Tasks taught in contexts including
       the outdoor setting appear to be generally fairly
       simple ones of the perceptual-motor type, and learners
       may be in a more receptive state than if they were
       seated at desks in an indoor setting.

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*It should be noted that term <u>setting</u> is used here in a sense that departs
from the usual meaning.

o Instructional-indoor. An instructional-indoor setting
  is one designed specifically for instruction and for
  protection from the elements. Teaching/learning
  activities are carried on in contexts including this
  setting at nearly anytime, but some uses of equipment
  (the operation of vehicles, for example) may not be
  feasible, and some needed or desirable items of equip-
  ment (tanks, for example) may not be present. Media
  devices and certain training devices, on the other hand,
  may be available and may not be available in any other
  setting. Student and other records (the data base
  necessary for individualized instruction) will be
  readily available, and the administration of paper-
  and-pencil tests is enhanced.

o Independent. The independent setting is one in which
  the soldier learns with little or no supervision. It
  may be a designed setting, such as a learning center,
  but it may just as frequently be a dayroom or the
  soldier's own room or home. A reasonably high state
  of motivation seems to be implied by learning activ-
  ities in contexts that include this setting, and a
  lack of motivation is therefore a strong constraint.
  The nature of learning materials is also a strong
  influence, a positive one in the case of materials
  designed for independent study and a negative one in
  the case of materials that are not (for example,
  manuals or other texts that do not accomodate the
  soldier's reading level).

Focus of instruction includes these categories:

o Equipment. The focus-on-equipment category identifies
  training that is concerned with the maintenance, nomen-
  clature, principles of operation, and functioning of
  Armor equipment, that is, with equipment as mechanisms
  or devices rather than as the means of accomplishing
  combat objectives. It includes the operation of equip-
  ment that is an aspect of maintenance or of learning
  nomenclature, principles of operation, and functioning.
  In order for this category to be useful for the design
  and conduct of individualized instruction, it must be
  thought of in terms of the actual conditions and arrange-
  ments of instruction that prevail in the training of
  certain Armor tasks, predominantly maintenance tasks.
  Because the student's view of equipment in this category
  is essentially analytic (that is, his attention is on the
  constituent parts of equipment) rather than synthetic (as
  it is when he learns to use the equipment to attain a
  combat objective such as hitting a target, moving from
  one position to another, or communicating combat infor-
  mation), the primary concern is with focusing his atten-
  tion narrowly and closely on elements of the equipment
  itself rather than on the uses of the equipment. Thus,

students, elements of equipment, and instructional pre-
sentations are arranged so that a succession of limited,
equipment-based stimulus conditions can be presented and
the responses closely guided and monitored. For the in-
structional developer or instructor, presenting the re-
quired stimulus conditions and providing the means for
student responses is a fairly simple matter, since no
more than equipment itself (or appropriate representations
of equipment), tools and materials, and instructions are
necessary. Because of the need to guide and monitor the
responses of individual students, however, the management
of learning may pose problems. Maintenance/inspection
tasks tend to be easy to learn but important to the preser-
vation and operability of the equipment. Such tasks also
tend to be done frequently by the soldier, often as fre-
quently as daily or weekly. There is, accordingly, a
marked emphasis on hands-on training in contexts that in-
clude this category. Facilities provided are usually at
least adequate, and the equipment itself (a tank, for ex-
ample) can provide a kind of facility. In contexts in-
cluding the focus on equipment the facilities factor can
be expected to be very influential, positively in the
sense that the equipment itself may be regarded as a faci-
lity, and negatively in the sense that some items of equip-
ment require special facilities (tanks, for example).

o Technique. The focus-on-technique category refers to human
functions, that is, to the "how to" aspect of the implements
and methods of combat. It includes learning to operate
equipment so as to cause it to achieve its designed purpose
(rather than simply learning to operate or manipulate it
as an aspect of maintenance or inspection). While the
focus-on-equipment category emphasizes learning how to
maintain and operate the components of the tank turret,
for example, the focus-on-technique category is concerned
with the use of the turret to attain a combat objective.
The tasks learned when the focus of instruction is on
technique, therefore, can be expected to be more cognitive
than the tasks learned when the focus is on equipment.
Perceptual-motor tasks are an aspect of technique, of
course, but the cognitive tasks (or, more precisely, the
cognitive aspects of tasks) are considerably more difficult
to learn than the typical task associated with the mainte-
nance, adjustment, setting up, or inspection of equipment.
The burst-on-target technique, for example, requires the
learning of a mental operation that is both moderately dif-
ficult for the typical soldier to learn and usually per-
formed under demanding conditions. This category, too, if
it is to be useful for the design and conduct of individ-
ualized instruction, must be thought of in terms of the
actual conditions and arrangements of instruction that pre-
vail in the training of certain Armor tasks, principally
those concerned with maneuvering against and destroying
enemy targets. The student acquires concepts and learns

rules and principles that underlie techniques or methods,
then learns the techniques or methods, usually as proce-
dures, and then learns to apply them under conditions in-
tended to represent the environment (usually the battlefield)
in which they are relevant. Nearly all battlefield tech-
niques or methods apply to the use or operation of equip-
ment, of course, but the student's view of equipment in
this category is synthetic (equipment as a part of a larger
scheme), rather than analytic (as when he considers its
elements), and his attention is thus fixed (or should be)
on the use of the equipment within its intended environment
to achieve its designed purpose, which is what techniques
or methods are about. For the instructional developer or
instructor, then, presenting the necessary stimulus condi-
tions and providing the means for student responses can be
quite demanding. Management of learning may pose a less
difficult problem than is the case in the focus-on-equipment
category, however, since the learning of cognitive elements
requires less guidance and monitoring, and the guidance and
monitoring of the application of techniques tends to be
inherent to the organization of teams/crews.

o Knowledge. The focus-on-knowledge category identifies
   training directed toward the acquisition of knowledge
   that is not a direct antecedent of performance. That
   is, when a soldier is learning within a context defined
   partly by this category, he is acquiring knowledge that
   may or may not be of use to him at some time in the
   future. If he should become a prisoner of war, for
   example, he will find his knowledge of the provisions
   of the Geneva Convention to be valuable, and knowledge
   about race relations gained in similar instruction may
   aid him in developing harmonious relations with his
   peers. But such knowledge, typically, is not directly
   related to the military (MOS) tasks he must regularly
   perform.

Time boundaries include these categories:

o Variable. Time in variable-time contexts may be manipu-
   lated by developers or implementers of instruction,
   within broad limits. The time actually available for
   learning varies widely from instance of instruction to
   instance of instruction, but instructional activities
   are not arbitrarily limited to certain amounts of time
   for certain units or tasks. Because a definite time for
   the completion of instruction is not given, instruction
   can presumably stop in response to an interruption of
   some sort (end of work day, detail, other instruction)
   and then begin again at the point of interruption.

o Fixed. Time for learning in fixed-time contexts may
   not be manipulated by developers or implementers of

instruction. Time is given by a schedule, and instruc-
tion is thus expected to be completed (for all students
regardless of learning ability) at definite times.
Presumably, if a trainee does not learn something he
will not have another opportunity until the subject/
task is rescheduled.

Thus, to classify a given context, one needs to know only the setting, the
focus, and the nature of the time boundaries. Knowledge of setting may be
gained directly from those involved in the implementation of instruction,
but it may often also be inferred from the nature of the content. It would
seem safe, for example, to assume that tank maintenance training in the unit
is outdoors (in the motor pool). The identification of the focus may be a
little more difficult. It should be possible to develop a taxonomy of MOS
tasks that would be largely or wholly consistent with the categories of the
focus dimension. If this were done, then the task description itself would
be a guide to the focus of the formal training that supports it. Determining
the nature of the time boundaries of a context may be even more difficult
because these boundaries are somewhat elastic in nearly all contexts, whether
the time is nominally fixed or variable. The best test seems to be the for-
mal definitions of the two categories of the time boundaries: that is,
variable time may be manipulated by those responsible for instruction in
order to enhance learning; fixed time is not subject to such manipulation.

The system for the classification of the contexts of instruction is repre-
sented in more detail in Table 2. In this representation, the definitions of
the categories of the dimensions have been included (in abbreviated form), and
the context classes have been identified through an alphabetical code. Thus,
a context in which the time is fixed, the focus is on technique, and the setting
is instructional outdoors would be classified BFH (Cell #6). Likewise, a con-
text given by variable time, a focus on knowledge, and an independent setting
would be classified DGI (Cell #24).

A Demonstration of the Classification System

To demonstrate the use of the system for classifying the contexts of in-
struction, several typical instructional activities are described below, and
by reference to the system their contexts are classified.

o Sub-calibre gunnery training is being conducted on a range
   especially constructed for the purpose. At a distance of
   about _____ a small carriage mounted on a track slowly moves
   silhouette targets transversely to the line of sight. Using
   lasers mounted on the gun tubes to indicate hits, the soldiers
   practice tracking and firing on moving targets. The commander
   of the unit conducting the training wishes to achieve several
   training objectives during the week, but he has assigned first
   priority to the learning of the tracking task and has therefore
   directed the officer in charge to continue instruction until 80%
   of the soldiers have mastered it.

Table 2

CLASSIFICATION OF CONTEXTS

	TIME							
	Fixed (H) (Learning is function of time)				**Variable (I)** (Time is function of learning)			
FOCUS	SETTING				SETTING			
	Operational (A) (Armor tasks under prescribed conditions)	Instructional, Outdoor (B) (Designed specifically for instruction)	Instructional, Indoor (C) (Designed specifically for instruction)	Independent (D) (Learning with little or no supervision)	Operational (A) (Armor tasks under prescribed conditions)	Instructional, Outdoor (B) (Designed specifically for instruction)	Instructional, Indoor (C) (Designed specifically for instruction)	Independent (D) (Learning with little or no supervision)
Equipment (E) (Nomenclature, maintenance, etc., of equipment)	(1) AEH	(2) BEH	(3) CEH	(4) DEH	(13) AEI	(14) BEI	(15) CEI	(16) DEI
Technique (F) ("How to" aspect of combat)	(5) AFH	(6) BFH	(7) CFH	(8) DFH	(17) AFI	(18) BFI	(19) CFI	(20) DFI
Knowledge (G) (Not a direct antecedent of performance)	(9) AGH	(10) BGH	(11) CGH	(12) DGH	(21) AGI	(22) BGI	(23) CGI	(24) DGI

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Classification

This instructional activity clearly focuses on technique; equipment is present, of course, and is essential to the task being performed, but what is being learned -- i.e., the tracking task -- is a technique, and the instruction is principally concerned with -- focused on -- the learning of that technique. The instruction is being carried on in an outdoor setting designed for instruction, and the time for learning (presumably within broad limits) is under the control of the implementer and therefore variable. The class of the context of this training is thus BFI (instructional-outdoor -- focus on technique -- variable time).

o An Armor battalion is conducting an offensive operations exercise. Because of many recent changes in staff positions and among headquarters personnel, the commander has decided to conduct formal on-the-job training in offensive operations for all staff officer's and headquarters personnel. The unit is scheduled to be in the field three days.

Classification

This activity is also focused on technique, that is, the "how to" of the functions of the headquarters during an offensive operation. Armor combat tasks are being performed under prescribed conditions, and the setting is therefore operational. The three-day exercise limits the overall time available, but time to learn may be considered variable within this limit. The class of the context of the training is thus AFI (operational -- focus on technique -- variable time).

o One hour each week has been scheduled for map reading, with a different topic for each of about 10 weeks. The practice in the past has been to present some aspect of map reading in a classroom and then move to a nearby drill field for a brief practical exercise.

Classification

The third activity must operate within fixed-time constraints, and it too is focused on technique. But because the setting changes during instruction, the activity appears to exist within a double context. Seen this way, the context (or, rather, contexts) would be CFH/BFH (instructional-indoor -- focus on technique -- fixed time and then instructional outdoor -- focus on technique -- fixed time). For the purpose of understanding the constraints and other characteristics of the instructional environment, however, it may be more useful to consider this instruction as consisting of two distinct activities whose contexts would be classified as CFH and BFH.

o CBR training has been scheduled for available personnel on each
   Friday morning. An outdoor area well away from other activities
   has been provided. In response to the commander's concern about
   CBR proficiency, the S-3 has directed the companies to continue
   the training until further notice.

Classification
This training activity appears also to be focused on technique.
Some segments may involve the use of equipment, but technique --
or "how to" -- is the dominant concern. Because required profi-
ciency is given, rather than time, the time for learning is vari-
able. The setting is outdoors and has been selected especially
for this training. The class of the context is therefore BFI
(instructional-outdoor -- focus on technique -- variable time).

o A course for the training of turret mechanics is to be conducted
   at the Armor School. A large classroom and a laboratory-like
   room containing turret trainers (real tank turrets modified for
   instruction) have been provided. Students are expected to
   achieve all course objectives within eight weeks but may take
   more time if necessary. Most are expected to complete the
   course in considerably less time.

Classification
In this activity the focus is on equipment. The instruction
is carried on indoors in rooms intended for instruction, and
again time is a function of given learning (i.e., all the
students are expected to achieve all of the objectives). The
class of the context is therefore CEI (instructional-indoor --
focus on equipment -- variable time).

o In a training brigade at the Armor School, individual weapon
   training (.45 cal. pistol) begins in classrooms where students
   learn the disassembly and assembly, care and cleaning, and
   functioning of the weapon. Then, in an outdoor area especially
   designed for the purpose, students learn the techniques of
   firing the weapon (positions, trigger squeeze, etc.). The
   time for the instruction is controlled by a schedule, and at
   a given time the students move on to other instruction.

Classification
This activity above, again, involves more than one context.
There is first a focus on equipment and then a focus on tech-
nique. There are also two settings, first indoors and then
outdoors. This instructional activity was described in such
a way by several instructors of the Armor School, and it was
clear that they thought of it as being unitary because the
same instructors and the same students were involved throughout.
Thus, they maintained that the activity existed within a double
context or, to put it another way, two cells of the classifi-
cation matrix were required to enclose the context of this in-
struction. But, again, it would appear to be more useful to
the analysis of contexts to see that there are two distinct

instructional activities and that their contexts may be clas-
sified as CEH (instructional-indoor -- focus on equipment --
fixed time) and BFH (instructional-outdoor -- focus on tech-
nique -- fixed time).

As will be seen more clearly in Chapter III, however, the fifth and sixth
instructional activities described above introduce an even greater difficulty
in the classification of the contexts of instruction according to the system
being described: the fifth and sixth are carried on at the institution, and
because the institution is dedicated to training, each context of instruction
within it is somewhat different from its counterpart within the units. This
difference cannot be fairly treated until the analysis of factors is presented
in Chapter III, but it can be pointed out that the factors that operate to de-
fine the various classes of contexts vary considerably from institution to unit.
At the institution instructors are instructors by virtue of full-time assign-
ment rather than one duty of many, and they seem to have adequate time for
preparation. Facilities at the institution tend to be better matched to their
purposes, resources somewhat more abundant, time for learning more readily
available, student-instructor ratios closer to optimal, and management-of-
learning capability greater. In brief, institutional contexts are generally
more favorable for the individualization of instruction than their counterparts
in the units. Thus, in Chapter III yet another dimension of classification is
introduced: On the basis of some parameters and constraints (student-instructor
ratios, for example) institutional contexts are distinguished from unit con-
texts. The general nature of a given context is the same whether it is in the
institution or the unit, but where there are significant differences in para-
meters and constraints between institutional contexts and unit contexts, the
differences are noted because of their probable impacts on the design and
conduct of individualized instruction.

Table 3 displays the classification of the contexts of a representative
sample of instructional activities (subjects/tasks) at the institution and in
the units. Each cell represents a context class, and an X in a cell indicates
the classification of the instructional environment or context of the instruc-
tional activities listed in the left margin. Sample instructional activities
at the institution (Fort Knox) and two unit installations (Fort Carson and
Fort Hood) are listed separately. These contexts were classified by training
implementers and some training managers. (See Chapter 1, The Collection of
Validation Data.) In several cases (map reading, tank firing, and individual
weapon training) the contexts of identical or nearly identical subjects/tasks
were classified both in the institution and in the units, and direct comparisons
may therefore be made. Table 3-1 presents this comparison. Within the units
the contexts of several subjects/tasks (CBR/NBC, gunnery, and tank maintenance)
were classified twice, and these classifications may also be compared. This
comparison is presented in Table 3-2. It will be noted that the contexts of the
same, or nearly the same, subjects/tasks vary in terms of one dimension or more
from instance of instruction to instance of instruction. The subjects/tasks
themselves are not, therefore, adequate guides to the selection of feasible and
appropriate approaches to individualized instruction. For the designer of sys-
tems of individualized instruction, the implication of this variability in the
contexts of the same, or nearly the same, instructional activities is that he
should: (1) design a system adaptable to all contexts in which an activity is
conducted; (2) design a different system for each different context in which an
activity is conducted; or, (3) design a system only for the context in which an
activity is most frequently conducted.

TABLE 3
SUBJECT/TASK BY CONTEXT CLASS

TIME →   FOCUS →   SETTING → (INSTR. = INSTRUCTIONAL)

Sub-column key: A = OPERATIONAL, B = INSTR. OUTDOOR, C = INSTR. INDOOR, D = INDEPENDENT

	FIXED (H)												VARIABLE (I)											
	EQUIPMENT (E)				TECHNIQUE (F)				KNOWLEDGE (G)				EQUIPMENT (E)				TECHNIQUE (F)				KNOWLEDGE (G)			
SUBJECT(S)/TASK(S)	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
(The Institution — Ft. Knox)																								
Fire Commands — BNCOC																			X					
Map Reading — BNCOC																		X	X					
Tank Firing Excercise — BNCOC																	X							
Range Estimation — BNCOC																	X		X					
Troop Management — BNCOC																			X					
Individual Weapons Training — OSUT			X			X	X																	
Indirect Fire — OSUT						X	X	X																
Target Acquisition & Identification — Wpn. Dept																								
Tank Turret Mechanic Course — Wpn. Dept.															X									
● Contexts Classified			1			2	2	1							1		2	1	4					

TABLE 3 (CONTINUED)
SUBJECT/TASK BY CONTEXT CLASS

TIME →
FOCUS →
SETTING → (INSTR. = INSTRUCTIONAL)

SUBJECT(S)/TASK(S)	FIXED (H)												VARIABLE (I)											
	EQUIPMENT (E)				TECHNIQUE (F)				KNOWLEDGE (G)				EQUIPMENT (E)				TECHNIQUE (F)				KNOWLEDGE (G)			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
(The Units – Ft. Carson)																								
Map Reading						X	X											X						
CBR																								
Gunnery – basic skills						X	X																	
Gunnery – subcalibre training																								
Race Relations (seminar)											X													
Geneva/Hague							X				X												X	
Combat Vehicle Identification																								
Pistol Marksmanship																	X							
Gunnery – Table VIII																	X		X					
Redeye – tactics																			X					
Gunnery – hands-on component																	X							
S2 – Tactical Operations Center																								X
Basic Skills Remedial (Reading, etc.)																			X					
Physical Training																	X		X					
Operation (Bn command level)																			X					
Gunnery – subcalibre training																								
● Contexts Classified						2	3				2						4	4					1	1

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TABLE 3 (CONTINUED)
SUBJECT/TASK BY CONTEXT CLASS

TIME →
FOCUS →
SETTING → (INSTR. = INSTRUCTIONAL)
SUBJECT(S)/TASK(S) →

SUBJECT(S)/TASK(S)	FIXED (H) EQUIPMENT (E)				FIXED (H) TECHNIQUE (F)				FIXED (H) KNOWLEDGE (G)				VARIABLE (I) EQUIPMENT (E)				VARIABLE (I) TECHNIQUE (F)				VARIABLE (I) KNOWLEDGE (G)			
	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)	OPERATIONAL (A)	INSTR.-OUTDOOR (B)	INSTR.-INDOOR (C)	INDEPENDENT (D)
(The Units – Fort Hood)																								
Gunnery – basic knowledge							X																	
Maintenance – tanks														X										
Tactics – use of terrain by drivers																	X							
Tactics – tank platoon																			X					
Maintenance – individual weapon							X							X										
NBC							X							X										
Maintenance – tanks							X							X										
Tank gunnery – assessment																	X	X	X					
Weapons qualification – familiarization																	X							
NCO training – leadership																	X							
Gunnery – range firing																								
● Contexts Classified						4	3							3			2	1	3					
● Totals by Context Class			1			4	8	1			2			3	1		8	6	7				1	1

TABLE 3-1
COMPARISONS OF CLASSIFICATIONS OF IDENTICAL OR NEARLY IDENTICAL SUBJECTS/TASKS

Institution vs. Units

TIME → · FOCUS → · SETTING → (INSTR. = INSTRUCTIONAL) · SUBJECT(S)/TASK(S) →

Legend for column codes — Groups: FIX = FIXED (H), VAR = VARIABLE (I). Categories: EQUIP = EQUIPMENT (E), TECH = TECHNIQUE (F), KNOW = KNOWLEDGE (G). Sub-codes: A = OPERATIONAL, B = INSTR.-OUTDOOR, C = INSTR.-INDOOR, D = INDEPENDENT.

SUBJECT(S)/TASK(S)	FIX EQUIP A	FIX EQUIP B	FIX EQUIP C	FIX EQUIP D	FIX TECH A	FIX TECH B	FIX TECH C	FIX TECH D	FIX KNOW A	FIX KNOW B	FIX KNOW C	FIX KNOW D	VAR EQUIP A	VAR EQUIP B	VAR EQUIP C	VAR EQUIP D	VAR TECH A	VAR TECH B	VAR TECH C	VAR TECH D	VAR KNOW A	VAR KNOW B	VAR KNOW C	VAR KNOW D
● MAP READING																								
Institution (Ft. Knox)																			X					
Units (Ft. Carson)							X											X						
● TANK FIRING																								
Institution (Ft. Knox)						X											X							
Units (Ft. Carson)							X										X							
Units (Ft. Hood)							X										X							
● IND. WEAPONS TRNG.																								
Institution (Ft. Knox)			X																					
Units (Ft. Carson)						X																		
Units (Ft. Hood)							X																	

TABLE 3-2
COMPARISONS OF CLASSIFICATIONS OF IDENTICAL OR NEARLY IDENTICAL SUBJECTS/TASKS

Units vs. Units

TIME →
FOCUS →
SETTING → (INSTR. = INSTRUCTIONAL)

Column headers (FIXED (H) and VARIABLE (I), each subdivided into EQUIPMENT (E), TECHNIQUE (F), KNOWLEDGE (G); each of those subdivided into OPERATIONAL (A), INSTR.-OUTDOOR (B), INSTR.-INDOOR (C), INDEPENDENT (D)).

SUBJECT(S)/TASK(S)	FIXED (H) EQUIP A	B	C	D	FIXED TECH A	B	C	D	FIXED KNOW A	B	C	D	VAR (I) EQUIP A	B	C	D	VAR TECH A	B	C	D	VAR KNOW A	B	C	D
● CBR/NBC																								
Units (Ft. Carson)																		X						
Units (Ft. Hood)							X																	
● GUNNERY, BASIC																								
Units (Ft. Carson)							X																	
Units (Ft. Hood)							X																	
● GUNNERY, SUBCAL																								
Units (Ft. Carson)						X																		
Units (Ft. Carson)																		X						
● MAINT., TANK																								
Units (Ft. Hood)														X										
Units (Ft. Hood)														X										

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Chapter III

ANALYSIS OF CONTEXTS

In Chapter II a system for the classification of the contexts of instruction was presented and discussed in some detail. It was found to be a satisfactory means for discriminating among contexts on the basis of the general dimensions of setting, focus of instruction, and time boundaries. This information alone would lead to some instructional design decisions of a gross sort -- such as to generally limit employment of systems requiring audiovisual devices to contexts with indoor settings -- but it is obviously not enough to allow the training developer to select from among a set of alternative models of individualized instruction the one or two models best for any given context. There are clearly other influences at work within the contexts. The capabilities of the instructors usually found within a given context, including the numbers of them in relation to the numbers of students, would certainly influence the selection of a model of individualized instruction for that context. The characteristics of the learners -- whether of low, medium, or high ability, whether motivated or not -- would also certainly constitute an important influence. It also seems likely that some instructional methods may be more suitable to some contexts than to others (learning in small steps with immediate and frequent feedback, for example, may generally be impracticable in contexts with the operational setting) and these too should influence the selection of alternative models of individualized instruction for any given context. Thus, in addition to a general classification of contexts, there would seem to be a need to consult a catalog of the factors which clearly influence or control the nature of instruction within any context. Then, if it can be shown that the influences of these factors are generally consistent and stable, within any given context class, to know the class of a context is to know generally how these factors would influence instruction conducted in it. And to know the influences or controls exerted by those factors is to have the means for selecting a model of individualized instruction that is feasible for a given context of instruction and likely to be effective within it.

The Controlling Factors

It is necessary to begin by identifying those factors that significantly influence or control the instructional processes within contexts. During the review and analysis of the literature of individualized instruction documented in Matlick et al. (1979), eight (8) such factors were identified and explored at some length. These factors are:

(1) Time Available - i.e., the amount of time available for learning the relevant skills and/or knowledge. In this case, time is not a dimension in the same sense as it is in the classifying matrix (see Figure 1). Rather, it describes constraints on learning, because whether the time boundaries are fixed or variable (i.e., whether under the control of developers and implementers -- within broad limits -- or not under their control) time is still available in discrete bundles that need to be considered for their influence on instructional processes.

Time will be available in one continuous block or in
smaller units such as an hour, half day, or full day at
a time. Even when the time boundary is variable, there
are generally accepted limits.

(2) Instructional Personnel - i.e., the availability of
personnel to provide the instructional functions, and/
or the planning and monitoring functions associated with
instruction. Included in this factor, at least by
implication, are the qualifications of these personnel
as instructors (many will not have been trained in the
methods of individualized instruction) and their attitudes
(negative attitudes towards individualized instruction
or toward any change in the process of instruction which
is perceived as being disadvantageous can sharply limit
the effectiveness of new instructional approaches).

(3) Facilities - i.e., the availability and type of facilities
for use in the instructional situation. As used here the
term facilities includes space for instruction whether in
a room in a building (a classroom) or a special area in
the field set aside and safe for, say, tank driving or
firing. They constitute whatever is required for the con-
duct of instruction that is not equipment, material, or
devices. They may be thought of as the most important
aspect of the instructional setting dimension. They in-
clude such mundane considerations as where audiovisual
devices will be plugged in and whether a tank can be
fired or manuevered over open terrain.

(4) Management - i.e., the methods and/or techniques employed
to manage and control the instructional situation. Implied
by the term management in this list of influencing or con-
trolling factors are both the management capability that
typically exists within a given context and the management
requirements that attend a given system or model of individ-
ualized instruction. Thus, a relevant question as regards
the assessment of this factor is: Are there enough instruc-
tors in this context to handle the management requirement
of this particular approach to individualized instruction?
(In this report the answer to this question is provided in
the form of a student-instructor ratio, i.e., the number
of students over the number of instructors; thus, a low
number -- say in the range of 4 to 8 -- represents a ratio
favorable to individualized instruction.) Or: Is the
typical instructor in this context capable of handling such
learning management tasks as the frequent and rapid admini-
stration of tests, the interpretation of tests and other
measures of learner performance, the development of pre-
scriptions for learning, and the control of contingencies?
The questions arising from this factor are qualitatively
different from those arising from the instructional personnel
factor. It is important to know that, in raw numbers, there

are in any given context the instructional personnel re-
quired by a particular approach to individualized instruc-
tion. But knowing that the number is adequate is not enough;
it is also necessary to know that the skills and attitudes
of the instructors are consistent with the learning manage-
ment requirements of any approach to individualized instruc-
tion that is under consideration.

(5) Student Population Characteristics - i.e., the learning
characteristics of the students who comprise the population
to whom the instruction is addressed. These include, of
course, aptitudes or abilities, but such characteristics
as attitudes and learning styles should also be considered.
While considerable diversity in learner characteristics is
the "reason for being" of individualized instruction, an
extreme range in one or more characteristic variables may,
for example, preclude one proposed approach to individ-
ualized instruction while recommending another.

(6) Course Content/Task Types - i.e., the content or the
subject matter to which the instruction is addressed. The
concern expressed by this factor is dealt with to some
extent by the focus-of-instruction dimension of the
classification matrix, and the factor may be a guide in
classifying a context. But once it is known that a
particular context involves a focus on, say, technique,
it is still necessary to know something about the content
or tasks. Some techniques are far more difficult, and
more important, than others and may require decidedly
different instructional approaches.

(7) Instructional Methods - i.e., the types of instructional
strategies and techniques which are applied to the subject
matter content. Within any given context of instruction
approaches to instruction, probably of the lockstep
variety, will already exist, and there will certainly be
a strong preference for certain instructional methods.
There may even be the assumption that because a certain
method has been employed for a long time in a certain
context for the teaching of certain tasks its validity
has been demonstrated beyond any need for change. Thus,
within certain contexts, given certain tasks or content,
some methods may be considered feasible and others not,
and the instructional methods inherent to a proposed
system or model of individualized instruction must be
considered in that light.

(8) Media/Materials/Devices - i.e., the training media,
materials and/or devices which are available and/or
appropriate for use in the instructional situation.
Because media, materials, and devices are costly,
those known to exist in or be available to a given
context of instruction should probably be considered
to be those through which any proposed system or model

of individualized instruction would be implemented.
The implementation of such a system may well involve
the addition of some media, materials, or devices, but
proposed systems should make use of those that already
exist.

The Description of Contexts

It is apparent, even without consulting this catalog of controlling or
influencing factors, that certain general and obvious inferences about contexts
may be systematically drawn from their classifications. In order to prepare
the way for the introduction of the above catalog of factors as a means of re-
fining knowledge of the nature of the contexts of instruction, it may be worth-
while to demonstrate such a general and inferential description of contexts.

Consider, for example, the following set of contexts as classified by the
system developed in Chapter II. These are the contexts of the typical training
situations described in Chapter II:

o BFI = Instructional outdoor -- focus on technique -- variable time.

o AFI = Operational -- focus on technique -- variable time.

o CFH = Instructional-indoor -- focus on technique -- fixed time.

o BFH = Instructional-outdoor -- focus on technique -- fixed time.

o CEI = Instructional-indoor -- focus on equipment -- variable time.

o CFH = Instructional-indoor -- focus on equipment -- fixed time.

Referring only to the descriptions of the dimensional categories given in
Chapter II and a general knowledge of Armor training, these may be described as
follows:

o BFI (instructional-outdoor -- focus on technique -- variable
time) - Particular arrangements for the instruction of indi-
viduals are present, but adverse weather may interfere with
learning. Facilities should be considered constraining, and
there may be no regularly available electrical power for in-
structional and training devices. The management of learning
will be constrained because of the restricted availability of
relevant records, but student-instructor ratios will probably
be favorable. The subjects/tasks to be learned involve pro-
nounced cognitive aspects and may be moderately difficult to
learn. The time for learning may be manipulated by developers
and implementers so that, within broad limits, all students
can be expected to achieve stated objectives. Thus, self-
pacing is implied, special physical arrangements at the train-
ing site may be necessary, and demonstrations of some sort will
probably be an aspect of instruction.

o AFI (operational -- focus on technique -- variable time) -
The setting is appropriate for the performance of unit/crew/
team tasks but not necessarily for the instruction of indi-
viduals. Typically, unit/crew/team tasks are performed as
required by a developing tactical situation while the per-
formances of individuals are monitored by unit leaders, and
feedback may be provided by leaders, either immediately or
after the conclusion of some phase of the operation. Some
time for individual instruction -- during lulls in opera-
tion -- will be available, but facilities are very constrain-
ing. Because of the presence of small-unit leaders, the
student-instructor ratios are favorable, however, and sol-
diers may be well motivated. The subjects/tasks to be learned
(e.g., gunnery, navigation, tactics) involve pronounced cog-
nitive aspects and may be difficult to learn under realistic
conditions. Within the constraints imposed by operational
requirements, however, time for individual learning may be
manipulated by developers and implementers. Thus, limited
self-pacing is implied, and special arrangements for indi-
vidual instructional communications are necessary.

o CFH (instructional-indoor -- focus on technique -- fixed
time) - Particular arrangements for the instruction of indi-
viduals are present and are not constrained by weather or by
the time of night or day. Appropriate practice may be con-
strained, however. Instructional and training devices may
generally be used, and the management of learning is enhanced
by the availability of student records, the variety of in-
structional materials, and the ease of administering pencil-
and-paper tests. The subjects/tasks to be learned (e.g.,
map reading, troop management, tactics) involve pronounced
cognitive aspects and may be moderately difficult to learn.
Time for learning may not be manipulated by developers and
implementers; i.e., learning is a function of given time.
Thus, alternative methods to minimize differential student
learning rates are implied, and demonstrations of some sort
along with appropriate provisions for practice will probably
be necessary.

o BFH (instructional-outdoor -- focus on technique -- fixed
time) - Particular arrangements for the instruction of indi-
viduals are present, but adverse weather may interfere with
learning. Facilities should be considered constraining, how-
ever, and there may be no regularly available electrical power
for instructional and training devices. The management of
learning will also be constrained because of the restricted
availability of relevant records, but student-instructor
ratios will probably be favorable. The subjects/tasks to be
learned involve pronounced cognitive aspects and may be moder-
ately difficult to learn. Time for learning may not be mani-
pulated by developers and implementers; i.e., learning is a
function of given time. Thus, alternative methods to minimize
differential student learning rates are implied, and demon-
strations of some sort will probably be necessary.

o CEI (instructional-indoor -- focus on equipment -- variable time) - Particular arrangements for the instruction of individuals are present and are not constrained by weather or by the time of night or day. Instructional and training devices may generally be used, and the management of learning is enhanced by the availability of student records, the variety of instructional materials, and the ease of administering pencil-and-paper tests. The subjects/tasks to be learned (e.g., tank maintenance, care and cleaning of individual weapons, and the nomenclature and functioning of individual weapons) tend to be easy to learn but important to the preservation and effective operation of equipment. There is a marked emphasis on hands-on training, and facilities are likely to be adequate though they may be constraining in regard to some items of equipment, such as tanks. The time for learning may be manipulated by developers and implementers so that, within broad limits, all students can be expected to achieve stated objectives. Thus, self-pacing, ready access by students to equipment or simulators, and adequate guidance of individual students during hands-on learning are all implied.

o CEH (instructional-indoor -- focus on equipment -- fixed time) - Particular arrangements for the instruction of individuals are present and are not constrained by weather or by the time of night or day. Instructional and training devices may generally be used, and the management of learning is enhanced by the availability of student records, the variety of instructional materials, and the ease of administering pencil-and-paper tests. The subjects/tasks to be learned (e.g., tank maintenance, care and cleaning of individual weapons, and the nomenclature and functioning of individual weapons) tend to be easy to learn but important to the preservation and effective operation of equipment. There is a marked emphasis on hands-on training, and facilities are likely to be adequate though they may be constraining in regard to some items of equipment, such as tanks. The time for learning may not be manipulated by developers and implementers; i.e., learning is a function of given time. Thus, alternative methods to minimize differential student learning rates are implied, and demonstrations of some sort along with appropriate provisions for guided practice will probably be necessary.

Each of these descriptions is given by the categorical (marginal) definitions which attend the cell of the classification matrix that "contains" the context. Each is simply a sum of three definitions (one from each of three dimensions), yet, as has been demonstrated, each leads to certain general implications for instruction. And if the implications for instruction are to be derived in more detail, then the contexts will need to be analyzed in more detail. In brief, each context needs to be analyzed to determine how it is controlled or influenced by each of the factors listed above. The analysis of contexts presented here proceeds from two bases: the first is the review of the literature of individualized instruction which led to a general understanding of the influences of the factors (see Matlick et al., 1979); the second is the detailed information about the instructional contexts of Armor training that

has been provided by training personnel (see Appendix A and Appendix B). But the data provided by training personnel -- if they are to be useful to the classification and analyses of the contexts of Armor instruction -- must be drastically reduced, and such a reduction requires a great deal of freedom to interpret and judge relative importance. The following attempt at such a reduction must therefore be considered tentative and subject to revision as the system of classification and analysis is refined by use.

It is important to understand both the treatment and the use of the data collected through informal observations, interviews, and questionnaires. Tables A.1.1, A.2.1, and A.2.2, in Appendix A, contain data from observations and from the administration of interviews and questionnaires at Fort Knox, Fort Carson, and Fort Hood respectively. (See Appendix C and Appendix D for instruments.) These data are descriptive of the contexts of instruction of specific subjects/ tasks. They were reduced by summarizing all parameters and constraints that pertain to the same context class within the same cells of the tables titled Parameters and Constraints of Variable Time/Fixed-Time Contexts (Table B.1.1, Table B.1.2, Table B.2.1, and Table B.2.2). For example, all the data descriptive of all contexts classified as C (Instructional-Indoor) -- F (Focus on Technique) -- I (Variable Time) at the institution (Fort Knox) are summarized in the eight rows of Table B.1.1 within the cell of each row given by the intersection of the category Technique (F) and the category Instructional - Indoor (C). Each row summarizes all data pertaining to one of the eight factors. It should be noted that, at this stage of the reduction, the data from the installations visited are still segregated; that is, the data from the institution are separate from the data of the units. The purpose of this is to permit the detailed examination of significant differences between contexts within the institution and contexts within the units. It should also be noted that while the classification matrix is three-dimensional the parameters-and-constraints tables are two-dimensional; for the sake of convenience in the presentation of data the classification matrix has, in effect, been divided into two, one for variable-time contexts and one for fixed-time contexts.

The descriptive data (parameters and constraints) may be examined by rows, by columns, and by time-table so that the differences among contexts may be discerned. It is apparent, for example, that the time available for learning tends to be described differently from setting to setting. It is also apparent that in some cases there are no noticeable changes from setting to setting, or from focus to focus, for that matter. It is also now possible, by summarizing whole columns or rows across pairs of tables (the variable-time table and the fixed-time table) and by comparing tables within pairs, to derive the meanings of the categories of the classification matrix beyond mere definitions. This last stage of the data reduction is tenuous, but it is made necessary by the large number of empty cells in the parameters-and-constraints tables. So few data descriptive of the contexts of Armor instruction were collected that all contexts identified by the classification matrix have not in fact been described. But if the descriptive information can be made marginal -- that is, if certain elements of description, in highly condensed form, can be attached to each category of each dimension of the classification matrix -- then every cell of the classification matrix can in fact be described. Given the amount of descriptive data now available, the descriptions may be highly inferential, but they will lead to some rational decisions about the selection of models of individualized instruction and the design of instruction.

This process of data reduction led, then, to the marginal or categorical descriptions (parameters and constraints) presented in Table 4 and summarized in Figure 2. Table 4 has three parts, each part providing category-by-factor parameters and constraints for a dimension. Figure 2 summarizes the classification and description of contexts to provide a conceptual overview. It includes both the definition of each category of each dimension and a very brief summary of some parameters and constraints associated with each category of each dimension. Through Figure 2 alone a context of instruction may be classified and then described in brief, summary fashion. Thus, Table 4, perhaps supported by Figure 2, yields essential descriptions of the contexts of instruction. Each part of Table 4 also includes the implications of the categories for both the selection of models and the design of instruction. These implications are, in effect, the bridge from the classification and description of contexts to the models of individualized instruction. *The models are described in Chapter IV.*

But the various categories of the classification system require a more detailed treatment. What follows is a discussion of each of the eight controlling or influencing factors as it applies to each category of each dimension of the classification system. *The use of Table 4 for the selection of models of individualized instruction or for the design of instruction should be preceded by a review of the discussion.*

It should be noted that the descriptions of categories which follow depend more on the review of the literature of individualized instruction and on the informed judgments of the authors of this volume than on the descriptive data collected training personnel at the installations where Armor training is conducted. These data, rather than primarily constituting the descriptions that follow, should be thought of as sources of guidance and restraint for the authors, as touchstones of reality.
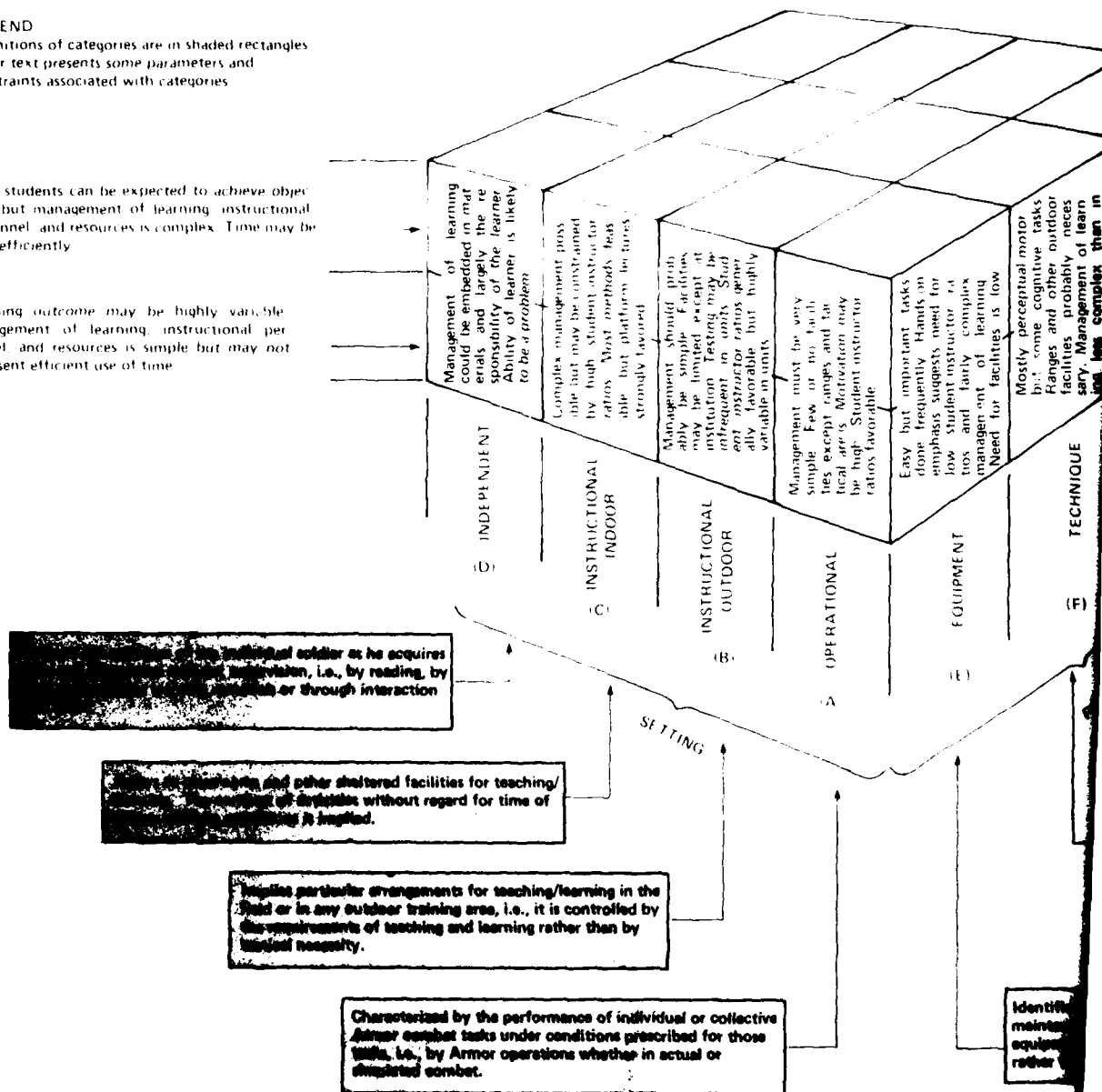

The Time Dimension

The time dimension identifies time-related influences that the instructional developer needs to be aware of as he makes time-related design decisions. This dimension will not tell him, for example, whether facilities are limited, but it will alert him to the influence of limited facilities on the design and implementation of instructional alternatives. Thus, this awareness, in conjunction with the information about facilities given by the other dimensions, will guide his decisions.

A. Fixed time. Fixed time means, it should be recalled, that time for learning cannot be manipulated by the developers (designers) or implementers of instruction beyond narrowly imposed limits; that is, learning must be seen as a function of given time. Presumably, such time is fixed as a result of the need to systematically control the activities and resources of the organization in which the instruction occurs. Thus, the instructional developer needs to anticipate the following conditions and issues in the design of instruction. He may, for example, decide not to provide alternative learning strategies where facilities appear to be unduly constraining, and he may decide to give considerable attention to *increasing student motivation in order to increase the efficiency of learning.*

VARIABLE (I)

More students can be expected to achieve objectives but management of learning instructional personnel and resources is complex. Time may be used efficiently

FIXED (H)

Learning outcome may be highly variable. Management of learning, instructional personnel, and resources is simple but may not represent efficient use of time
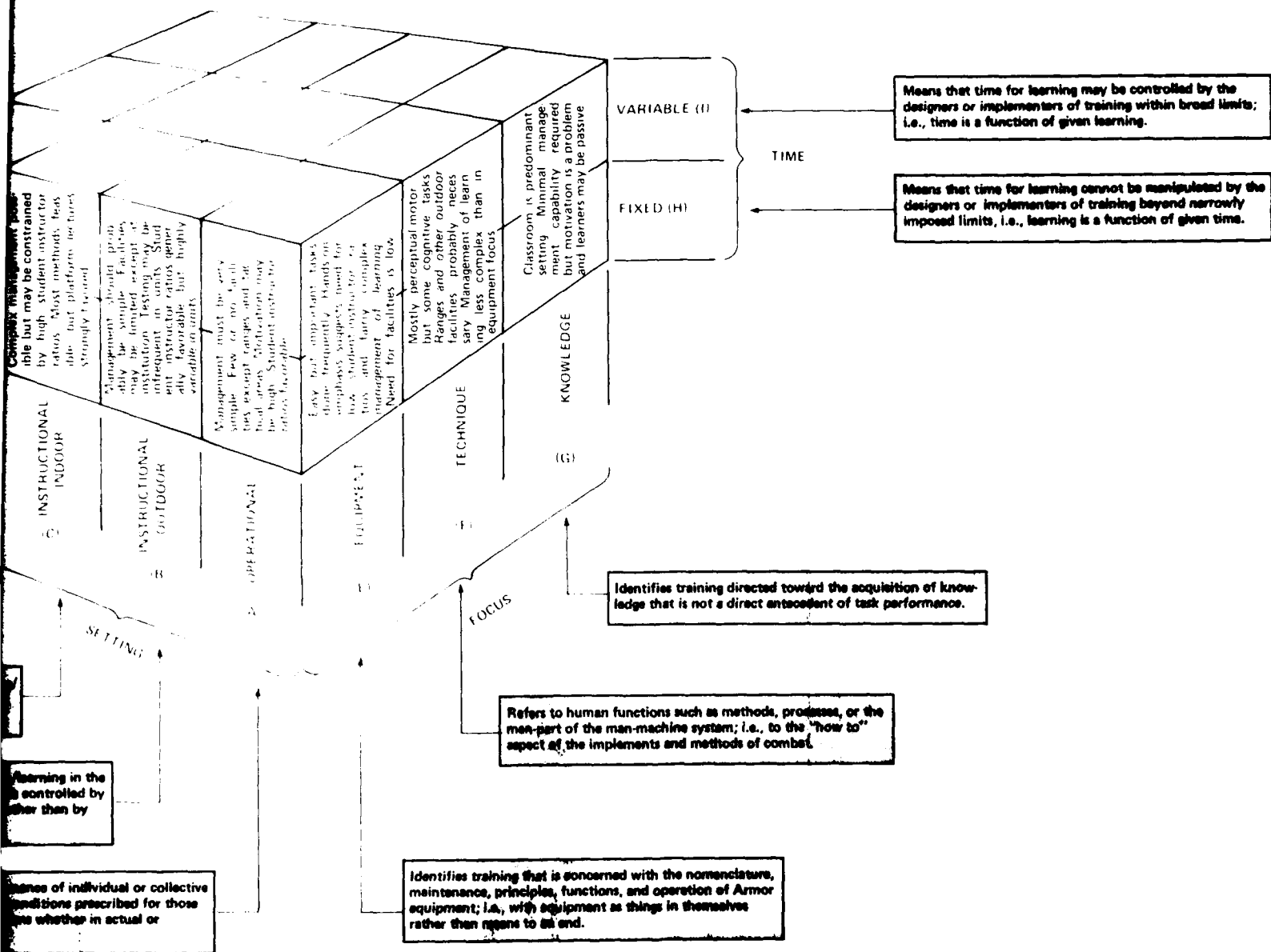
Management of learning could be embedded in materials and largely the responsibility of the learner. Ability of learner is likely to be a problem

Complex management possible but may be constrained by high student-instructor ratios. Most methods teachable but platform lectures strongly favored

Management should probably be simple. Facilities may be limited except at institution. Testing may be infrequent in units. Student-instructor ratios generally favorable but highly variable in units

Management must be very simple. Few or no facilities except ranges and tactical areas. Motivation may be high. Student-instructor ratios favorable

Easy but important tasks done frequently. Hands-on emphasis suggests need for low student-instructor ratios and fairly complex management of learning. Need for facilities is low

Mostly perceptual-motor but some cognitive tasks. Ranges and other outdoor facilities probably necessary. Management of learning likely complex then in...

INDEPENDENT (D)

INSTRUCTIONAL INDOOR (C)

INSTRUCTIONAL OUTDOOR (B)

OPERATIONAL (A)

EQUIPMENT (E)

TECHNIQUE (F)

SETTING

...individual soldier as he acquires ...vision, i.e., by reading, by ... or through interaction

...and other sheltered facilities for teaching/ ...without regard for time of ...is implied.

...particular arrangements for teaching/learning in the field or in any outdoor training area, i.e., it is controlled by the requirements of teaching and learning rather than by ...necessity.

Characterized by the performance of individual or collective Armor combat tasks under conditions prescribed for those tasks, i.e., by Armor operations whether in actual or simulated combat.

Identifi... maint... equip... rather...

VARIABLE (I)

TIME

FIXED (H)

Means that time for learning may be controlled by the designers or implementers of training within broad limits; i.e., time is a function of given learning.

Means that time for learning cannot be manipulated by the designers or implementers of training beyond narrowly imposed limits, i.e., learning is a function of given time.

KNOWLEDGE

(G)

Classroom is predominant setting. Minimal management capability required but motivation is a problem and learners may be passive

TECHNIQUE

(F)

Mostly perceptual motor but some cognitive tasks. Ranges and other outdoor facilities probably necessary. Management of learning less complex than in equipment focus

EQUIPMENT

(E)

Easy but important tasks done frequently. Hands on emphasis suggest need for high student/instructor ratios and fairly complex management of learning. Need for facilities is low

OPERATIONAL

(A)

Management must be very simple. Few or no facilities except ranges and field areas. Instruction may be high. Student/instructor ratios favorable

INSTRUCTIONAL OUTDOOR

(B)

Management should probably be simple. Facilities may be limited except for instruction. Testing may be infrequent in units. Student instructor ratios generally favorable but highly variable in units

INSTRUCTIONAL INDOOR

(C)

Complex management possible but may be constrained by high student instructor ratios. Most methods feasible but platform lectures strongly favored

SETTING

FOCUS

Identifies training directed toward the acquisition of knowledge that is not a direct antecedent of task performance.

Refers to human functions such as methods, processes, or the man-part of the man-machine system; i.e., to the "how to" aspect of the implements and methods of combat.

Identifies training that is concerned with the nomenclature, maintenance, principles, functions, and operation of Armor equipment; i.e., with equipment as things in themselves rather than means to an end.

learning in the ... controlled by ... ther than by

... ance of individual or collective ... ditions prescribed for those ... ... whether in actual or

Figure 2 - Classification and Analysis of Contexts

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TABLE 4

DESCRIPTIONS OF DIMENSIONAL CATEGORIES

A. The Setting Dimension

Factors	Operational (A)	Instructional, Outdoor (B)	Instructional, Indoor (C)	Independent (D)
Time Available	o During lulls in operations. o Overall time may be 1-3 days.	o Blocks of half day may be typical. o Adverse weather constrains.	o 1-hour periods scheduled 2-3 times a week. o Solid blocks of half day or more.	o Hours of operation of learning center may constrain. o Deadlines for acquiring skills and knowledge may constrain.
Instructional Personnel	o Student-instructor ratios about 3-6. o Instructors also busy small-unit leaders except in institution.	o Student-instructor ratios may be about 3-6 but are highly variable in units. o Instructors are troop leaders in units, full-time instructors in institution.	o Student-instructor ratios of 15-30 may be typical but may be high as 60 in units. o Ratios generally lower in institution.	o Limited need for instructional personnel. o Some contact with subject matter expert may be necessary as well as media services.
Facilities	o Ordinary facilities for instruction do not exist (but, for example, consider tanks, etc., as facilities). o Ranges and tactical areas probably available.	o Facilities usually associated with individualized instruction do not exist. o Lack of suitable ranges, etc., constrains some tasks, and these may be difficult to schedule.	o Classrooms, labs of various types, shops, other indoor areas may be available. o Space may be inadequate and sharing may result in conflicts.	o May not be an important factor. o Some materials (TEC lessons, for example) require learning centers or similar facilities.

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Table 4 (cont'd)

Factors	Operational (A)	Instructional, Outdoor (B)	Instructional, Indoor (C)	Independent (D)
Management of Learning	o Must be very simple. o Little reliance on written tests or student records for instructional decisions (more in institutions than in units).	o Individualized capability exists where student-instructor ratio is fairly low. o Testing infrequent in units; access to records restricted. o Informal performance tests appear compatible. o Probably should be kept simple.	o Enhanced by ease of administering tests, wealth of instructional resources, access to records. o May be constrained by high student-instructor ratios. o Not much testing or counseling in established practice.	o Capability limited. o Management strategies may be embedded in instructional systems. o May include offering learning in this setting as alternative to instruction in another setting.
Learner Characteristics	o Motivation may be high, especially at institution. o Ability of entry-level students low, advanced students high.	o Primary equipment (tanks, etc.) is *motivating* and likely to be present in outdoor setting. o Ability of entry-level students low, advanced student high.	o Increased availability of printed instructional materials is asset only if students have adequate reading ability. o Ability of entry-level students low, advanced students high.	o Poor reading and memory abilities and similar traits are important considerations.
Course Content/ Task Types	o Predominantly collective but also individual combat tasks. o Individual contribution to collective tasks may be appropriate for individual instruction.	o Probable emphasis on hands-on training. o Setting may represent second choice for some subjects/tasks, with indoor setting being first.	o Favored for subject/tasks with pronounced cognitive aspects. o Teaching/learning of some subjects/tasks severely constrained (simulation may lessen constraints).	o Cognitive learning most common. o Elements of nearly all tasks can be learned in this setting.

Table + (cont'd)

Factors	Operational (A)	Instructional, Outdoor (B)	Instructional, Indoor (C)	Independent (D)
Instructional Methods	o Hierarchical ordering of objectives, typical of mastery learning, in order to identify reasons for failure to perform tasks under prescribed conditions. o Use of peer instruction (e.g., the proctors of PSI).	o Most "major methods" generally applicable. o Limited management capability constrains methods. o Limited use of instructional media constrains methods.	o Nearly all "major methods" and features are feasible. o May be resistance because of strong predilection for platform lecture. o Teaching skills associated with individualized instruction probably most important to this setting.	o Programmed instruction and CAI are obvious choices. o Features of other "major methods" also relevant.
Media, Materials, and Devices	o Probably only printed materials are usable (FMs, TMs, IETS-type packages). o Some types of simulation may be feasible.	o Constrained by limited usefulness of most media and some materials and training devices. o For entry-level students, reading may be last choice for presentation of content. o Instructors likely to be principal means of presentation. o Training devices frequently not operational in units.	o Nearly all AV devices, types of instructional materials, and training devices are usable. o Many are present, especially in the institution.	o FMs, TMs, and other training publications probably most common materials. o When locus is learning center, other media available. o Use of training devices probably sharply restricted.

Table 4 (cont'd)

Implications	Operational (A)	Instructional, Outdoor (B)	Instructional, Indoor (C)	Independent (D)
For Selection of Models	o Treatments should probably be fixed. o Because soldiers at different skill levels may be trained at same time, objectives could be variable. Proficiency should probably be fixed. (Variable proficiency probably would not be acceptable in setting.)	o Treatments should probably be fixed because of constrained facilities. o Objectives should probably be fixed because of constrained management.	o Treatments should probably be variable. o Objectives could be fixed or variable depending on subjects/tasks and resources. o Proficiency should probably be fixed because content probably represents basic knowledge and skills.	o Treatments should be variable. o Objectives should be variable. o Proficiency could be fixed or variable, but fixed when content represents basic knowledge and skills of critical tasks.
For Design of Instruction	o Instruction materials should probably be brief IETS-type packages (see Matlick et al., 1979, under Management) o Systems should not employ instructional devices. o Peer-instruction probably needed to reduce load on small unit leaders, except in institution. o Objectives should be hierarchical (see IETS) o Instructional decisions should probably be based on informal performance tests or observations of leaders/ instructors. (See IETS,	o Systems should make only limited use of instructional devices. o Instructional decisions should probably be based on informal performance tests. o Peer instruction (proctoring) indicated when student-instructor ratios are high. o Small group instruction and tutoring should be considered when student-instructor ratios are favorable. o Alternatives should be developed to deal with unavailable or unusable facilities and devices. o Primary equipment should be employed wherever possible.	o Small steps should probably be emphasized to make use of brief instructional periods. o Peer instruction (proctoring) should be considered, especially when student-instructor ratios are very high. o As much as possible, management of learning should be built into instructional materials. o Pencil-and-paper tests should probably be emphasized. o A variety of means of instructional presentation should be employed, but printed materials probably should not be emphasized.	o Simple materials with adequate prompts, visual aids, and memory aids should probably be emphasized. o Self-check tests should be emphasized. o Wide variety of media should be employed. o Alternatives to device-dependent materials should be considered.

Table 4 (cont'd)

B. The Focus Dimension

Factors	Equipment (E)	Technique (F)	Knowledge (G)
Time Available	o Appears to be more than adequate. o Substantial blocks of perhaps 8 hours.	o Tends to be scheduled in solid blocks of from several hours to more than a day. o May be scheduled in one-hour periods several times a week, weekly, or monthly.	o Generally, one or two hours scheduled as needed. o Time in learning centers is less constrained.
Instructional Personnel	o Need to be expert. o Student-instructor ratios are generally low, in range of 3 to 8 o Ratios of 10 to 12 or higher probably severely constraining.	o Personnel highly skilled in techniques may not be available. o Range of student-instructor ratios is extreme, from low of perhaps 2 to as high as 80.	o Student-instructor ratios quite high, up to 30 or 40 or more.
Facilities	o Major items of equipment (tanks, etc.) require special facilities (shops, sheds, motor parks).	o Must provide for practice (e.g., tank firing ranges). o Gunnery facilities may be inadequate in units.	o Setting most likely to be instructional-indoor but may also be independent.
Management of Learning	o Because handling or manipulation of equipment may be essential to learning, strategies must avoid queuing. o Hazards in use of equipment require close monitoring of students.	o Testing may be more frequent in this focus than in others. o Strategies must provide practice, verify learning, and avoid queuing.	o Capability likely to be severely constrained if setting is instructional-indoor. o Strategies likely to be simple and built into materials.
Learner Characteristics	o Instructional alternatives could be based on motor abilities. o Gross lack of motor ability or mechanical aptitude may constrain. o Entry-level students low in motivation and achievement.	o General aptitude and achievement of prerequisite skills and knowledge should influence design of instruction. o Entry-level students low in motivation and ability. o Advanced students average or high in motivation and ability.	o Poor reading ability constraining. o Low motivation constraining.

Table 4 (cont'd)

Factors	Equipment (E)	Technique (F)	Knowledge (G)
Course Content/ Task Types	o Emphasis on hands-on, perceptual-motor tasks. o Easy to learn but important and done frequently.	o Pronounced cognitive aspects but may be regarded as essentially perceptual-motor. o Fairly complex mental operations may mediate performance (e.g., BOT method of fire adjustment). o Tend to be difficult to learn but important.	o Typical content areas are Geneva Convention, race relations, and basic skills (reading, arithmetic, etc.). o Learning essentially cognitive but may involve some effective elements.
Instructional Methods	o PSI (Keller Plan) may be most appropriate because of requirement for mastery before progression and use of proctors to monitor small groups. o Self-pacing, small-step learning, and contingency management seems feasible.	o Most "major methods" appropriate, depending on setting and time constraints. o Self-pacing, learning in small groups, adaptive training, peer tutoring or proctoring, and demonstrations may be useful. o Lectures and printed materials likely to be of limited value.	o Programmed instruction and CAI strongly indicated. o Lectures and peer tutoring also likely to be effective. o Necessary to keep students from being passive.
Media, Materials, and Devices	o If context is in institution, materials and training devices likely to be plentiful. o If in the unit, may be no more than actual equipment, necessary tools, and a few manuals. o JPAs/SPAs very useful. o Training devices may be both less costly and more effective than actual equipment.	o Simulators of great value and some are present, especially in institution. o Demonstrations probably necessary (AV or human models). o Materials/devices needed for some content areas/tasks limited or not available (e.g., CBR).	o May be mostly texts. o Some AV and programmed materials available especially in learning centers.

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Table 4 (cont'd)

Implications	Equipment (E)	Technique (F)	Knowledge (G)
For Selection of Models	o Variable treatments appear to be desirable and feasible. o Objectives should probably be fixed in units; variable objectives may be useful in institution. o Proficiency should probably be fixed because tasks are basically simple and important to preservation of equipment.	o Treatments fixed or variable depending on setting. o Proficiency should probably be fixed because tasks/skills may be prerequisites of other tasks/skills.	o Treatments should probably be variable in independent setting and fixed in all others. o Objectives and proficiency fixed in case of required knowledge. o Objectives and proficiency variable in case of optional knowledge.
For Design of Instruction	o Management strategies should include close monitoring of each student by instructor/proctor. o Diagnostic pretests could include assessment of motor abilities/mechanical aptitude to predict time on task and preferred treatment. o Training devices should be employed when they are available. o Exemption pretests could be used to identify students who could serve as proctors. o Materials should include procedural guides (JPAs).	o Content/tasks should be analyzed to objectives or sub-objectives that are generally attainable within brief periods of instruction (an hour or less). o Materials should include plenty of prompts, cues, and procedural guides (mnemonic devices, for example). o Alternative management strategies should reflect extreme range of student-instructor ratios and sometimes inadequate facilities. o Exemption pretests could be used to identify students who could serve as proctors.	o Materials should require only minimal reading ability. o Basic skills materials are commercially available. o Variable treatments should be keyed to such basic characteristics as reading ability, memory ability, and perhaps learning style. (See Air Force AIS in Matlick et al., 1979 under Learner Characteristics). o For some content areas (Geneva Convention, race relations) the lecture should probably be an instructional alternative.

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Table 4 (cont'd)

C. THE TIME DIMENSION

Factors	Fixed Time (H)	Variable Time (I)
Time Available	o Time available for given task or unit of content probably determined from experience. o Time may be more than is needed when appropriate technologies are employed. o Distribution of practice, skill decay, etc., should be considered in light of how time is provided (solid blocks, one-hour periods three times a week, etc.).	o Must not be thought of as unlimited time but as limits within which some individual differences may be accommodated. o Time may be determined empirically. o Distribution of practice, skill decay, etc., should be considered in light of how time is provided (solid blocks, one-hour periods three times a week, etc.).
Instructional Personnel	o Allows for simple management of personnel. o Low student-instructor ratios and specialized personnel (proctors, tutors) may be necessary if individualized instruction is to be attempted.	o Training of instructors in methods of individualized instruction an important consideration. o Low student-instructor ratios are favorable to individualized instruction.
Facilities	o Scheduling may be simplified. o Alternative strategies of individualization (to minimize differential learning rates) may require additional facilities.	o Limited facilities constrain individualization. o Scheduling may be difficult.
Management of Training	o Variability in achievement must be expected (proficiency or objectives will vary). o Variable treatments may reduce variability in achievement. o Selection may reduce variability in achievement.	o Progress management is needed where self-pacing is employed. o Fairly complex management strategies may be necessary.

Table 4 (cont'd)

Factors	Fixed Time (H)	Variable Time (I)
Learner Characteristics	o Motivation is of interest because high motivation would imply more efficient learning. o Achievement likely to be highly variable unless students are selected on basis of fairly uniform learning rates.	o Broad range of aptitudes and learning styles less a problem than in fixed-time contexts, but extreme ranges may constrain.
Course Content Task Types	o No apparent implications.	o No apparent implications.
Instructional Methods	o Conventional or group ("lockstep") instruction is appropriate. o If individual differences are to be accommodated, methods of mastery learning may be appropriate.	o Self-pacing fully appropriate. o Most methods of individualized instruction are implied.
Media, Materials, and Devices	o In conventional or group instruction will be conventional and probably minimal. o If instruction is individualized, a variety will be required to implement alternatives.	o Methods of individualized instruction generally imply a wealth of media, materials, and devices.

Table 4 (cont'd)

Implica- tions	Fixed Time (H)	Variable Time (I)
For Selection of Models	o Fixed-time models should be selected. o If all students must be at least exposed to all objectives and student-instructor ratios are high, select conventional instruction.	o Variable-time models should be selected.
For Design of Instruction	o Exemption pretests should be employed to free some students to act as tutors or proctors. o Student records should include objectives not achieved when instruction stops. o Instructional alternatives should be designed to deal with learner characteristics that contribute most to individual learning rates (reading ability, memory ability, motivation, etc.) See Air Force AIS in Matlick et al., 1979, under Learner Characteristics. o Double check task analysis to assure that no irrelevant or unnecessary knowledge or skills are included. o Determine if selection may be employed. o Use motivation management and contingency management techniques to increase learning.	o Use learner characteristics to predict time on task, record actual time on tasks, and counsel student accordingly. (See tank turret mechanic course and the Air Force AIS in Matlick et al.,1979, Chapter IV.)

1. Time available. The time actually available for the learning
    of any given task or unit of content, when the time is fixed,
    is apparently determined from experience over a considerable
    period of time. The time needed by an average person in the
    training population to learn a given task or unit of content
    eventually becomes established within instructional schedules.
    But the evidence suggests that the time required to learn given
    tasks or content units can be reduced through appropriate tech-
    nologies. Thus, the time actually given in fixed-time contexts
    may not be a reliable guide to the time actually needed. The
    way in which available time is provided (solid blocks of time
    or one-hour periods scheduled daily or weekly, for example) may
    be of interest when such issues as distribution of practice and
    skill decay (forgetting) are of concern.

2. Instructional personnel. Fixed time allows for simple manage-
    ment of instructional personnel, but if efforts are made to
    minimize the effects of differential learning rates (so that
    all or most students will be able to achieve stated objectives
    within the fixed time allotted) a large number and variety of
    instructional personnel may be needed.

3. Facilities. The scheduling of facilities is simplified when
    the time for learning is fixed, but, again, if efforts are
    made to minimize the effects of differential learning rates
    through alternative strategies, additional facilities may
    be needed. To put this another way, the lack of facilities
    can severely constrain the employment of alternative strategies.

4. Management of learning. Fixed time implies variability in objectives
    or proficiency levels or both. Thus, in fixed-time contexts consid-
    erable variability in achievement must be expected though this
    variability can be reduced somewhat through the introduction of
    variable treatments (instructional alternatives matched with individual
    differences; see above). Selection for instruction on the basis of
    ability which predicts success can also reduce variability in
    achievement. It may be neccessary, however, to train instructors in
    the management methods employed.

5. Learner characteristics. Unless the learners within fixed-time con-
    texts are selected on the basis of homogeneity in characteristics
    that influence learning rates, achievement will be highly variable.
    See above. Because the evidence suggests that all students engaged
    in learning spend a good deal of time in irrelevant activities,
    motivation appears to be a characteristic of some importance for
    the fixed-time category since high motivation would imply less
    time in irrelevant activities and thus more efficient learning.

6. Course content/task types. This factor appears to have no differential
    implications for fixed-time contexts.

7. Instructional methods. If individual differences among learners are
    not to be accommodated, the methods of conventional or group instruction
    ("lockstep") are appropriate. Through lectures, demonstrations,

practical exercises, and other such methods, the group is paced
through the fixed-time. If individual differences (i.e., different
learning rates and styles) are to be accommodated, however, a variety
of individualized methods - such as those of mastery learning, for
example -- will be necessary to minimize the effects of these
differences.

8. Instructional media, materials, and devices. Again, if individual
   differences are not to be accommodated (and considerable variability
   in achievement is to be tolerated), media, materials, and devices
   may be conventional and perhaps minimal. But if individual differ-
   ences are to be accommodated, a variety of media, materials, and
   devices will be required to implement the variety of instructional
   alternatives.

B. Variable time. The meaning of variable time, it will be recalled, is that
the time for learning is controlled by the designers and implementers of in-
struction within broad limits; that is, time is regarded as a function of given
learning. In order to fully exploit variable time the instructional developer
must carefully consider the following influences. He may decide, for example,
to include materials for the training of instructors or group-instruction alter-
natives to be employed when student-instructor ratios are not favorable to more
common forms of individualized instruction.

1. Time available. Variable time does not mean unlimited time;
   it means that the instructor or designer is able to make
   individual adjustments in the time allotted to the learning of
   given tasks or content units. For any instructional activity
   (course, unit, lesson) the time actually allotted may be
   determined empirically. The time required by the slowest and
   fastest learners as well as the average time may lead to deci-
   sions about the time to be allotted for learning given tasks
   or the content of courses. Again, the way time is scheduled
   (a solid block, one or more hours a day, one or more hours
   once a week, for example) can influence decisions in regard
   to such issues as distribution of practice and skill decay
   (forgetting).

2. Instructional personnel. If variable time is regarded as an
   opportunity to accommodate individual differences through self-
   pacing and other features of individualized instruction, then the
   training of instructors in the methods of individualized instruc-
   tion becomes an important consideration. Further, low student-
   instructor ratios are generally favorable to individualized
   instruction.

3. Facilities. Again, if variable-time contexts are seen as
   opportunities to accommodate individual differences of learners,
   there will be a need to provide a variety of learning activities
   simultaneously. Limited facilities are therefore constraining
   as regards the provision of instructional alternatives. Facili-
   ties are usually shared, and scheduling may therefore be difficult.

4. Management of learning. Progress management is needed where self-pacing is employed. Accommodation of individual differences within variable-time contexts generally requires fairly complex management strategies since learners are treated one at a time rather than in groups.

5. Learner characteristics. A broad range of aptitudes and learning styles within the population of learners is less a problem in variable-time contexts, but extreme ranges may nonetheless be constraining. It may not be reasonable to expect learners of lowest aptitude to achieve the same objective as learners of the highest aptitude within any feasible overall time no matter what instructional alternatives are employed.

6. Course content/task types. This factor appears to have no differential implications for variable-time contexts.

7. Instructional methods. Self-pacing is fully appropriate but should probably be employed in conjunction with progress management. Most other methods of individualized instruction are also implied.

8. Media, materials, and devices. The methods of individualized instruction (self-pacing, instructional alternatives, etc.) generally imply a considerable wealth of media, materials, and devices.

The Setting Dimension

The setting dimension identifies the setting-related conditions (parameters and constraints) and influences that the instructional developer must consider as he makes design decisions. The system he develops should reflect the range of realities identified. He could, for example, provide one management plan to be used when the student-instructor ratio is below a certain value and another to be used when the ratio is above that value.

A. Operational. This setting is characterized by the performance of individual and collective Armor tasks under simulated or actual combat conditions, and any instruction of individuals must therefore be compatible with operational requirements and conditions.

1. Time available. Time for individual instruction will probably be available to different individuals at different times in different amounts during lulls in operations, but the requirements and conditions of the operations must be considered as severe constraints. Fairly long blocks of overall time appear to be associated with this setting and 1 to 3 days may be typical.

2. Instructional personnel. The instructors are also small-unit leaders whose time and energies are largely taken up by operational responsibilities, but student-instructor ratios are favorable, apparently of the order of about 3 to 6.

3. Facilities. Facilities for the instruction of individuals, in the ordinary sense, probably do not exist, but some items of equipment -- tanks, for example -- provide a kind of facility for some kinds of tasks. Ranges and tactical areas probably exist and are available.

4. Management of learning. Management of learning under operational conditions must be very simple both because the instructor's primary responsibility is most likely to be the operation itself (not true in the institution) and because of the operational conditions. There could, for example, be little or no reliance on written tests or student records as means of making instructional decisions. There appears to be some testing but probably more in the institution than in the units.

5. Learner characteristics. The motivation of learners may be high, especially at the institution. Entry-level students will be low in ability, advanced students high.

6. Course content/task types. Tasks are predominantly collective, as defined by the operation (e.g., engagement of targets, navigation, communication), but individual contributions to such tasks, as well as individual combat tasks, are appropriate subjects for individual instruction.

7. Instructional methods. Two of the "major methods " of individualized instruction identified by Hess and Lehman (1976) (See Matlick et al., 1979, pp. 51, 52) appear to be generally relevant to contexts that include this setting. If an individual is unable to satisfactorily perform the tasks required by the operation, it may be that he has failed to master prerequisite skills and knowledge. If that is the case then any individual instruction should concentrate on such skills and knowledge. The hierarchical ordering of learning objectives is characteristic of mastery learning. Further, because small-unit leaders (who are also the instructors) must devote most of their time and energy to the operation itself, there must be heavy reliance on peer instruction (the use of proctors or tutors) and written materials to communicate the content of instruction. These needs suggest several characteristic features of Personalized System of Instruction (PSI).

8. Media, materials, and devices. Probably only printed materials (FMS, TMS, and perhaps brief instructional packages) are usable in contexts including the setting. Some types of simulation may be feasible.

E. Instructional-outdoor. This setting is characterized by particular arrangements for the instruction of individuals but is without protection from the elements. It is thus constraining in terms of both weather conditions and the time of day.

1. Time available. Time for instruction is likely to be available in fairly large blocks, half a day perhaps being typical. Time may be constrained by adverse weather.

2. Instructional personnel. Student-instructor ratios tend to be favorable, perhaps as low as 3 to 6, but ratios tend to be much more variable and somewhat higher in the units than in in the institution. Instructors tend to be experienced in tasks/subjects. In units they are usually troop leaders while at the institution they are full-time instructors by assignment.

3. Facilities. Training areas are generally adequate, but the kinds of facilities usually associated with individualized instruction do not exist, and the use of electrically powered instructional and training devices is usually not feasible. Some items of equipment, tanks, for example, may provide a kind of facility. The lack of suitable ranges, tank driving areas, and similar facilities is severely constraining for some tasks, and the difficulties inherent in scheduling such facilities may also be constraining.

4. Management of learning. Individualized management-of-learning capability probably exists because of generally favorable student-instructor ratios, but testing in contexts including this setting tends to be infrequent in units and access to student records is restricted. Informal performance tests appear to be compatible with the setting. Probably only simple management strategies are feasible.

5. Learner characteristics. This factor appears to have no particular consequences for contexts including this setting, but primary equipment (tanks, etc.) is motivational and this is more likely to be present in outdoor settings.

6. Course content/task types. This setting does not necessarily preclude any content areas or task types, but there appears to be an emphasis on hands-on learning in contexts that include it. It may represent a second choice for some content areas or tasks when indoor settings are not available.

7. Instructional methods. Most "major methods" of individualized instruction (see Hess and Lehman, 1976) appear to be generally applicable, as do most features of individualized instruction, but limited management capability and limits on the use of instructional media both constrain methods. Audio-tutorial and computer-assisted instruction, for example, would not be feasible in contexts including this setting, and multi-media presentations would be difficult.

8. Media, materials, and devices. The limited usefulness of most media and some materials and devices is constraining. Furthermore, instructors may regard reading as a last choice for the presentation of content when learners are entry-level soldiers. Instructors are likely to be the principal means of presentation of content. Devices used in this setting, such as the lasers used for gunnery training, are frequently not operational in units, but the tank itself may be seen as a training device.

C. __Instructional-indoor__. The setting is characterized by particular arrangements for the instruction of individuals and is not constrained by weather conditions or the time of night or day.

1. __Time available__. Time for learning is likely to be available in 50-minute periods scheduled two to three times a week or solid blocks of a half day or more.

2. __Instructional personnel__. Student-instructor ratios may be unfavorable in the units, perhaps as high as 60, though 15 to 30 may be more typical. Ratios tend to be lower in institutional contexts including this setting than in corresponding unit contexts.

3. __Facilities__. Facilities consist of classrooms (sometimes multipurpose), trainer/simulator labs, shops, and sometimes areas intended for other purposes, such as storage. They may be constraining both because of inadequate space and because they must be shared with other activities.

4. __Management of learning__. Management of learning is enhanced by the ease of administering pencil-and-paper tests, by easy access to student records, and perhaps by a wealth of media, materials, and devices, but it may be constrained by high student-instructor ratios (see above). Generally, established practice in unit contexts including this setting does not appear to include much testing or counseling of learners.

5. __Learner characteristics__. This factor appears to be of little consequence for contexts including the instructional-indoor setting, but the increased availability of printed instructional materials should be considered an asset only when warranted by the reading abilities of learners.

6. __Course content/task type__. The instructional-indoor setting appears to be favored for, and may often be most suitable for, subjects/tasks with pronounced cognitive aspects, especially basic knowledge and skills. The teaching/learning of some subjects/tasks in contexts including this setting may be severely constrained, but appropriate simulation may overcome the constraints somewhat.

7. __Instructional methods__. Nearly all "major methods" and features of individualized instruction are feasible within contexts that include this setting, but the predilections of instructors and students must be considered constraining. Some features and methods of individualized instruction -- such as self-pacing and contingency management -- may be more acceptable to instructors and students than others, but individualized instruction, as a class of instructional practices, may be accepted only with reluctance. Furthermore, the preeminence of the platform lecture in contexts that include this setting suggests that even highly experienced instructors may be deficient in the teaching skills required by the methods of individualized instruction.

8. **Media, materials, and devices**. Nearly all audiovisual devices, types of instructional materials, and instructional/training devices are usable and many are present, especially in the institution.

D. **Independent**. This setting delimits the activities of the individual soldier as he acquires skill and knowledge without supervision -- by reading, by using independent learning materials, or by interacting with peers -- and it must therefore not be thought of as a definite place. It could be a learning center but it could just as well be a dayroom or the soldier's room or home.

1. **Time available**. If the student chooses a learning center for independent study (or is encouraged or directed to study in a learning center) the hours of operation will be a constraint in addition to the requirements of the workday. The time for learning may also be constrained by deadlines for acquiring skills needed for Skill Qualification Tests (SQT). If the learning within contexts that include this setting is an aspect of instruction being carried on in other contexts, then the time boundaries of that instruction apply also. The instruction in some contexts including other settings apparently requires some independent study.

2. **Instructional personnel**. Instructional personnel are necessary only in limited ways. When the learning center is the locus of the independent setting, personnel are needed to staff it. The student who learns in contexts that include this setting needs to have access to subject-matter experts and perhaps to media, materials, devices, and those needs imply some use of personnel.

3. **Facilities**. This factor appears to have little consequence for the independent setting. Independent learning can occur nearly anywhere, though the use of some materials (TEC lessons, for example) requires learning centers or similar facilities.

4. **Management of learning**. The independent setting does not imply learning without management. The mere fact that a student chooses to learn within a context that includes this setting indicates that he has begun to manage his own learning, and this development can be encouraged through the design of systems that include self-check tests and other self-management devices (see, for example, the time management modules incorporated by the Air Force AIS). Offering study within contexts that include this setting as an alternative to classroom or other formal instruction is another form of learning management that applies to this setting. Management capability within contexts including this setting appears to be limited both in the institution and in the units.

5. **Learner characteristics**. Learner characteristics need to be assessed so that appropriate systems and materials may

be designed for contexts that include this setting. Poor
reading ability, for example, would indicate a need for
heavy reliance on audiovisual materials or programmed
instruction, while poor memory ability would suggest the
inclusion of memory aids.

6. Course content/task types. Nearly any kind of content or
   tasks can be approached in contexts including this setting,
   but cognitive learning appears to be most common. Perceptual-
   motor learning may require the use of equipment, and it seems
   certain that safety considerations would restrict the use of
   this in contexts including the independent setting. But be-
   cause all military tasks include some cognitive elements, at
   least some elements of all tasks could be learned in such
   contexts.

7. Instructional methods. Programmed instruction and computer
   assisted instruction (CAI) are the obvious methods for
   contexts including this setting, but other "major methods"
   (see Hess and Lehman, 1976, in Matlick et al., 1979), or at
   least features of them, need not be ruled out. Contingency
   management in the form of contracting, for example, would
   seem to be appropriate. The informal use of proctors (a
   feature of Personalized System of Instruction), especially
   to provide some feedback and praise, would also appear to
   be appropriate.

8. Media, materials, and devices. Though the most common
   materials in contexts including this setting are certainly
   manuals (FMs and TMs) and other training publications, other
   media are appropriate and may be available, especially when
   the locus of the setting is a learning center. Training
   devices may not be available, however, especially if they
   are hazardous.

The Focus Dimension

The focus dimension identifies conditions (parameters and constraints) and
influences related to variation in emphasis on kinds of learning. In a sense,
this dimension can be seen as a psychological variable of the classification
matrix (just as the setting dimension can be seen as representing a physical
variable and the time dimension a time variable), and the instructional de-
veloper should therefore be guided by it in providing the arrangements and
conditions for learning. He may, for example, include in his instructional
system both a set of instructional alternatives based on differences in motor
ability and a diagnostic pretest to assess motor ability.

A. Equipment. This focus of instruction identifies training that is concerned
with the maintenance, nomenclature, principles, functioning, and inspection of
Armor equipment; that is, with equipment as things in themselves rather than
means to an end. It implies an emphasis on hands-on training (perceptual-motor
learning).

1. Time available. Because the time available for learning in contexts that include the focus on equipment appears to be more than adequate, this factor should not be constraining unless queuing problems arise. Time appears to be scheduled in substantial blocks, perhaps eight (8) hours.

2. Instructional personnel. Instructors need to be expert, especially when instruction involves major items of equipment. Student-instructor ratios appear to be low in most contexts that include the focus on equipment -- in the range of 3 to 8 -- but they may at times be much higher in the units. Ratios of 10 to 12, or higher, are probably severely constraining both because of the nature of the tasks being learned and because of the requirements of appropriate instructional methods.

3. Facilities. Major items of equipment -- tanks, for example -- require special facilities such as shops (sheds) and motor parks.

4. Management of learning. Because handling or manipulation of equipment is likely to be essential to learning, and equipment (or simulators of equipment) is likely to be limited, learning management strategies must be designed to avoid queuing. Because of hazards in the use of equipment and the possibility of damage to equipment, management strategies will also provide for close monitoring of student use of equipment. Generally low student-instructor ratios suggest high management capability.

5. Learner characteristics. Assessment of motor abilities may be of value if alternative instructional treatments are to be provided (see discussion of Fleishman's taxonomy of motor abilities in Matlick et al., 1979, pp. 44, 45). A gross lack of motor ability or mechanical aptitude may be constraining. Motivation and achievement of entry-level students are likely to be low.

6. Course content/task types. In contexts that include the focus on equipment the emphasis is on hands-on, perceptual-motor tasks. The tasks are typically easy to learn but important and done frequently. Consequences of inadequate performance may be serious.

7. Instructional methods. Of the "major methods," Personalized System of Instruction (Keller Plan) appears most appropriate because of the requirement for mastery before progression and the use of proctors to monitor small groups. Self-pacing, small-step learning, and contingency management seem to be feasible.

8. Media, materials, and devices. If the context including the focus on equipment is institutional, materials (such as job-performance aids) and training devices are likely to be plentiful. If it is in the unit, there may be no more than actual equipment, necessary tools, and a few manuals. Job-performance aids (or Skill Performance Aids) will be very useful, and training devices may be both more effective and less costly than actual items of equipment.

B. Technique. This focus of instruction refers to human functions such as methods, processes, or the man-part of the man-machine system; that is, to the "how to" aspect of the implements and methods of combat. It implies a pronounced emphasis on cognitive learning.

1. Time available. Time tends to be scheduled in solid blocks of from several hours to more than a day, but for some content areas/tasks one-hour periods may be scheduled several times a week, weekly, or monthly. It must be sufficient to allow for practice and demonstration of skills.

2. Instructional personnel. Personnel highly skilled in techniques being taught are desirable but may not be available in the units. Instructors in gunnery appear to be highly skilled, however. The range of student-instructor ratios is extreme, from low of 2 to as high as 80.

3. Facilities. Facilities must provide whatever is needed to practice techniques, such as tank firing ranges and driving areas. Gunnery facilities for training in units may be inadequate.

4. Management of learning. Testing may be more frequent in contexts including this focus than in other contexts. Management strategies may be fairly complex when instruction is individualized because of a need to provide practice time, verify learning, and avoid queuing. Management capability varies widely as shown by range of student-instructor ratios.

5. Learner characteristics. General aptitude and achievement of prerequisite skills and knowledge are likely to influence the design of instruction. Poor reading ability may constrain the learning of complex techniques. Entry-level students tend to exhibit low motivation and ability while advanced students are average or high in motivation and achievement.

6. Course content/task types. Content areas/tasks learned in contexts including this focus include pronounced cognitive aspects though they may often be regarded as essentially perceptual-motor tasks (as in gunnery). Fairly complex mental operations may mediate performance, as is the case,

for example, in the burst-on-target method of fire adjustment. Tasks tend to be difficult to learn but important.

7. Instructional methods. The cognitive elements of learning suggest that most of the "major methods" of individualized instruction would be appropriate, depending on setting and time constraints, since these methods were developed primarily for cognitive learning. Self-pacing, learning in small steps, and adaptive training may be feasible. Peer tutoring or proctoring and demonstrations of various kinds will be useful but lectures and printed materials are likely to be of limited value.

8. Media, materials, and devices. Simulators are of great value and some are present, especially in the institution. Demonstrations of techniques through audiovisual presentations or human models is probablv necessary. Materials and devices needed for some content areas/tasks (CBR, for example) are limited or not available.

C. Knowledge. This focus of instruction identifies training directed toward the acquisition of knowledge that is not a direct antecedent of task performance.

1. Time available. One or two hours are scheduled as needed to comply with regulations or other demands. Other times, perhaps three (3) hours at a time, may be arranged for independent study. Other activities with higher priorities are likely to be severely constraining. Time in learning centers is less constrained.

2. Instructional personnel. This factor may be of little consequence for contexts including the knowledge focus. Student-instructor ratios may be quite high, however, up to 30 or 40 or more.

3. Facilities. This factor also appears to be of little consequence. The setting is most likely to be instructional-indoor but it may also be independent.

4. Management of learning. If the setting is instructional-indoor, management capability is likely to be severely constrained because typical practice is to provide one instructor per class regardless of its size. In any event, management strategies are likely to be quite simple and possibly built in to the materials.

5. Learner characteristics. Poor reading ability and low motivation may be constraining.

6. Course content/task types. Typical content areas include the provisions of the Geneva Convention that apply to prisoners of war, race relations, and basic skills remediation (reading, arithmetic, etc.). Learning is likely to be essentially cognitive but may involve some affective elements.

7. Instructional methods. Programmed instruction and computer-assisted instruction are strongly indicated, but lectures and peer tutoring are also likely to be effective. It is necessary to keep students from being passive.

8. Media, materials, devices. Instructional materials are likely to consist largely of texts, but some audiovisual and programmed materials will be available, especially in learning centers.

Given more detailed descriptions of the categories that define the contexts (or, more precisely, the context classes), the contexts may now be described in considerably more detail. As an illustration of the greater detail now available, one of the context descriptions given above -- that of the contexts classified BFI (instructional-outdoor -- focus on technique -- variable time) -- is expanded considerably below. This expanded description may be compared with the one above:

> Particular arrangements for the instruction of individuals are present, but adverse weather may interfere with learning. Facilities should be considered constraining, and there may be no regularly available electrical power for instructional and training devices. The management of learning will be constrained because of the restricted availability of relevant records, but student-instructor ratios will probably be favorable. The subjects/tasks to be learned involve pronounced cognitive aspects and may be moderately difficult to learn. The time for learning may be manipulated by developers and implementers so that, within broad limits, all students can be expected to achieve stated objectives.

1. Time available. Time is likely to be available in fairly large blocks, from half a day to a full day or more, but for some subjects/tasks one-hour periods may be scheduled several times a week, weekly, or even monthly. The time provided must be sufficient to allow practice and demonstration of skills.

2. Instructional personnel. Student-instructor ratios tend to be low, perhaps as low as 3 to 6, and these are favorable to individualized instruction. But if this variable-time context is to be considered an opportunity to accommodate individual differences through individualized instruction, the training of instructors in the methods of individualized instruction must be carefully considered. Though the instructors tend to be experienced in the subjects/tasks they teach, they may not be highly skilled.

3. Facilities. Again, if this context is seen as an opportunity for individualized instruction, there will be a need to provide a variety of learning activities simultaneously. Furthermore, facilities must provide whatever is needed to practice techniques, such as tank firing areas and driving areas. Training

areas are generally adequate, however, though the facilities
generally associated with individualized instruction do not
exist. Limited facilities constrain the provision of instruc-
tional alternatives.

4. Management of learning. Management strategies adopted
should reflect a trade-off between the complexity generally
required by individualization and the simplicity indicated
by the setting, but individualized management-of-learning
capabilities probably exist because of low student-instructor
ratios. Testing tends to be infrequent in this setting, when
the context is in the unit, though it may be more frequent in
the focus of instruction than in the other focuses with outdoor
settings, and access to student records is restricted. Still,
progress management is needed when self-pacing is employed.
Informal performance tests appear to be compatible with this
context.

5. Learner characteristics. A broad range of aptitudes and
learning styles within the learner population may not be
a serious problem, but extreme ranges may be constraining.
It may not be reasonable to expect learners of the lowest
aptitude to achieve the same objectives as learners of the
highest aptitudes within any feasible overall time no matter
what instructional alternatives are employed. Poor reading
ability may constrain the learning of complex techniques.
Entry level students tend to exhibit low motivation and
ability while advanced students are average or high in
motivation and achievement. Primary equipment (tanks, etc.)
is motivational, and this may be present.

6. Course content/task types. Content areas/tasks learned in
this context include pronounced cognitive aspects though
they may often be regarded as essentially perceptual-motor
tasks (as in gunnery). That is, there appears to be an
emphasis on hands-on learning, but fairly complex mental
operations may mediate performance, as is the case, for
example, in the burst-on-target method of fire adjustment.
Tasks tend to be difficult to learn but important. The
context may represent a second choice for some content
areas or tasks when indoor settings are not available.

7. Instructional methods. The cognitive elements of learning
suggests that most "major methods" of individualized instruc-
tion would be appropriate since those methods were developed
primarily for cognitive learning. Self-pacing, learning in
small steps, and adaptive training may be feasible, but limited
management capability and limits on the use of instructional
media will constrain methods. Peer tutoring or proctoring
and demonstrations of various kinds will be useful, but
lectures and printed materials are likely to be of limited
value.

8. Media, materials, and devices. The methods of individualized instruction generally imply a considerable wealth of media, materials, and devices, but most media and some materials and devices will be of limited usefulness. Materials and devices needed for some content areas/tasks (CBR, for example) are limited or not available, and instructors may regard reading as a last choice for the presentation of content when learners are entry-level soldiers. Simulators are of great value, however, and some will be present. Instructors are likely to be the principal means of presentation of content, and demonstration of techniques through human models is probably necessary.

The implications for the design of instruction are that self-pacing through small steps is a probable feature, physical arrangements at the training site -- especially to provide the means for individual practice and demonstrations of techniques -- may be necessary, and demonstrations of techniques by instructional personnel may be the best choice. Management of learning, including progress management, should probably be based on informal performance tests and the intimate knowledge of learners that the instructors are likely to have. One-to-one tutoring -- perhaps peer tutoring -- should be provided for slow learners. Procedural guides to the conduct of instruction should be prepared for instructors and simple job-performance aids for students.

It should be noted that this narrative description of a context is for the purpose of illustration only and that for practical purposes contexts would be classified and much more tersely described by reference to Table 4 and Figure 2.

It should also be noted that no attempt has been made in this volume to describe each context class given by the classification matrix. It is clear that the dimensions of the matrix interact and that the way in which contradictory or divergent indications are resolved is a matter of judgment. One instructional developer, for example, might look at the very simple management of learning dictated by the operational category of the setting dimension and then at the fairly complex requirements of the equipment category of the focus dimension and describe the context as one in which the management of learning is demanding. Another developer might examine the same divergent indications and describe the context as one in which fairly complex management of learning is not a problem because of the low student-instructor ratios. Thus, because each cell of the classification matrix delimits a class of contexts rather than only a single context, any description of a context class may be closer to a single context within that class than to the class itself, depending on the biases and perceptions of the person doing the classification and description. That is, a context class is delimited by a range of indications coming out of each factor, and the categories of Table 4 yield the range for each factor. Simply presenting a sum of all indications in each of the twenty-four cells of the classification matrix would probably only obscure the nature of a context class.

Chapter IV

SELECTION OF MODELS OF INDIVIDUALIZED INSTRUCTION

Sixteen instructional systems models are discussed in this chapter. These were introduced in Chapter III of Matlick et al. (1979) and the numbering system used in this chapter is consistent with Figure 9 of that report (p. 86). The sixteen models arise from a four-dimensional space in which each dimension represents an instructional design variable. The four dimensions are instructional treatment, student proficiency, instructional objectives, and time available for learning. Each dimension may be either fixed or variable.

Dimensions of the Models

Instructional treatment refers primarily to how the instruction is delivered. Examples of instructional treatments include textbooks, lectures, various audiovisual devices, study guides, and tutorials. A fixed treatment model is one in which the same treatment is used for all students. Most traditional instruction is fixed treatment. In most academic settings, for example, the treatment combines lectures and textbooks. No special provisions are made for such individual student differences as reading ability. A variable treatment model, on the other hand, is one in which the intent is to match the instructional treatment to the individual characteristics of the students. For example, students might be administered a reading level test upon entering the instructional system. Then, good readers might be given a textbook and allowed to proceed independently, while poorer readers might use a study guide to supplement their reading of the textbook in order to insure their understanding of the most critical material. Students with severe reading problems might attend tutorial sessions to supplement their reading.

A fixed-treatment model may present problems for the individualization of instruction; a variable-treatment model implies individualization by definition. On the other hand, a fixed-treatment model presents fewer management problems and will have lower development costs than a variable-treatment model. In general, a variable-treatment model is preferred if the particular application can support it. Fixed-treatment models can also provide effective individualized instruction, however.

Student proficiency refers to the performance levels expected of students who complete an instructional program. Fixed proficiency implies that all students are expected to reach the same performance level, as in mastery learning programs, which are examples of fixed-proficiency models. The required proficiency level is usually set at the level of performance necessary to perform a job, to continue on to the next segment of instruction, or to attain some other criterion external to the instruction. Students who perform at or above the preset proficiency levels are considered successful and pass. Students who do not reach criterion fail. Fixed proficiency does not recognize individual differences among students. All students must achieve the same fixed level. Many applications of fixed proficiency instructional models are, however, individualized in that some method of individualization is used to permit all students to achieve criterion performance.

Variable proficiency models do not have set criterion performance levels for all students. Variable final performance within such models may occur because individual differences among students are not accommodated in the instructional systems as is the case in most traditional instruction. Consider once again the traditional textbook-with-lecture classroom. At the end of some period of instruction it is usually found that the students vary in their abilities to perform. If a variable-proficiency instructional model described this classroom, the result would be as expected. Notice that this case is not an example of individualized instruction.

Variable performance may also be a method of individualization. In such cases students with differing needs or desires could have unique expected final performance levels. For example, imagine instruction designed to teach introductory automobile engine maintenance. For those students who intended to become skilled mechanics the final proficiency levels would be high. Other students, however, might desire to gain only a sufficient amount of information to become reasonably well informed consumers. For those students, the proficiency level could be set much lower. Variable proficiency as a technique for individualization is relatively easy to implement; it does not demand particularly sophisticated management, and it does not involve costly multiple treatments. Variable proficiency must be employed with caution, however, to insure that proficiency is not permitted to fall to unacceptably low levels.

The third dimension is instructional objectives. Most traditional instruction represents instructional models with fixed objectives. That is, all students are expected to achieve the same objectives within any particular instructional program. Different programs will, of course, have different objectives, and one of the early methods for introducing individualization into instruction at a relatively high level was the multi-track (academic, business, vocational) system. Requiring all students to achieve the same group of instructional objectives does not, of course, recognize individual differences, but for many applications a fixed-objective model is required. This is particularly true for instruction which has been designed around a critical set of objectives.

Variable instructional objectives can help individualize instruction when the context permits this strategy. One application of variable instructional objectives is the technique of performance contracting. In performance contracting, the student and instructor select a set of objectives to be achieved during instruction. The objectives will often contain a core of objectives required for all students as well as objectives keyed to the desires, interests, or abilities of individual students. This technique can easily be combined with a variable-proficiency model to permit considerable flexibility and individualization. A corollary to performance contracting is a system which ties groups of objectives to grades or some other end-of-instruction reporting system. Under these conditions the objectives would be grouped into objectives required for minimum competency, objectives representing greater depth or breadth of the subject matter, objectives concerned with side issues, and so forth. Students who chose to achieve only the minimum competency objectives would receive a minimally acceptable evaluation. Those students who chose to go on would be appropriately rewarded. The main difference between this approach and pure performance contracting is that performance contracting takes place before instruction begins. The corollary system could be implemented in a way which permits students to decide whether they want to continue at the time that they finish the minimum requirements.

Variable-objectives models can present management and cost problems. These models tend to incur higher instructional development costs than fixed—objectives models because instruction must be available for whatever mix of objectives is chosen. Having different students working on different groups of objectives also presents problems in scheduling presentations, making sure that students achieve the objectives for which they are accountable, and providing counseling to students who need help in choosing objectives.

The fourth, and perhaps most important, dimension is time. Time refers to the amount of time made available for learning. In a fixed-time model, all students must complete the instruction within given time limits. The amount of learning possible is, to a great extent, a function of time. Within a variable-time instructional model, the time available for learning is guided by what is learned. Students who are able to may complete the instruction quickly. Students who need more time are permitted to have it. But to some extent, all formal instruction takes place within fixed-time constraints. The difference between fixed-time and variable-time instructional models is, therefore, in one sense a matter of degree. But it is also a matter of emphasis. A fixed-time model emphasizes time; a variable-time model emphasizes learning.

There are methods for individualizing instruction within fixed-time models. One method is to explicitly recognize that some students will need extra time and schedule review time into the instruction. Other methods rely on variable treatments, proficiency, or objectives to accommodate individual differences. Regardless of the method used with fixed-time models, there remains the problem of what to do with the student who has not achieved whatever was required within the time allowed.

Variable-time models permit the widest variety of approaches to individualization. At the simplest level, variable time means that students may take as much time as they need to review or repeat the instructional materials. As variable-time models become more complicated, they permit recycling with different objectives, allowing students to attain higher proficiency, or trying alternative instructional treatments.

The primary problem with variable-time models in general is that a management system must be made flexible enough to accommodate students leaving the system at different times, perhaps entering the system at different times, and probably working at different stages of the instruction. These problems can be overcome with a variety of methods including the use of self—instructional materials to as great an extent as possible, the use of faster students as peer tutors or proctors, and the development of empirically based measures to predict the time likely to be needed by various types of students. If the desire is to individualize, variable-time models will be less costly and more likely to be successful than fixed-time models having the same values of the other dimensions.

Description of the Models

The models are illustrated with flowcharts (Figures 3-10). The flowcharts show the basic processes and decision points which characterize the models. They are intentionally not detailed to permit maximum generalizability across content and particular management systems and to take full advantage of procedures which

are well documented in the Interservice Procedures for Instructional Systems Development (ISD; TRADOC Pamphlet 350-30). The application of ISD procedures with respect to the models discussed here is addressed later in this chapter.

The flowcharts have several characteristics in common. Processes are designated with rectangular boxes, decision points with diamonds. The solid lines show the basic characteristic flow of each model. The broken lines indicate common optional paths. Specific applications of the models will probably require additional details of flow. Each flowchart represents two models which are identical except with respect to the proficiency dimension; one model employs fixed proficiency, the other variable proficiency. The two flowcharts can be combined because the only change in the flow is at the pass-fail decision point. In fixed-proficiency models all students are judged by the same criteria. In variable proficiency models the passing criteria vary from student to student. An application which includes counseling for students to help them choose a proficiency to work for is considered a special case, and the detailed flow required to describe the counseling process is left to be added at the time of design of instruction.

All of the models show an optional "exemption pretest" loop near the beginning of the flow. This loop is made optional, in contrast to many published instructional design models, because strictly speaking the instruction can take place without it. It is true that allowing able students to exempt instruction by examination is generally efficient, well accepted, and a relatively easy way to individualize. It is, however, expensive to develop a good exemption test, it is time consuming to use it, and the management system must be ready to accommodate students who pass the test and have no need to pursue the instruction. Therefore, in certain cases, particularly if it is known that the students are not likely to be able to achieve the instructional objectives, it may be better to omit an exemption pretest. If an exemption pretest is elected it should occur very early in the system flow, and the pretest design should be consistent with the instructional design.

The flowcharts assume that objectives guide the instructional system. Hence, the pretest is designed around the instructional objectives. According to the flowchart, a student would be tested on each objective in turn. The flowchart therefore implies that instruction would be necessary only for those objectives that are not passed. This is not possible in many applications. In those cases in which the instruction cannot be divided, that is, where the entire group of objectives must be exempted or nothing is exempted, the flow would have to be modified to reflect a single multiple-objective pretest and one decision point. If the test is not passed, the student would enter the instructional flow. If it is passed, he or she would exit.

Another option that appears in all the models just before the exit process is labeled "assign." "Assign" refers to the process of making some decision about what happens to each student next, an implicit part of the instructional process. The "assign" process is optional because a given management system of which the instruction is only a small part may already be performing this function, because it is not required for successful delivery of instruction or student learning, or because the prevailing philosophy does not include such decisions within the purview of instruction. The process is included here because it is extremely important, particularly in individualized instruction where students

may be leaving the system at different times, having achieved different objectives at a variety of proficiency levels. In many applications of individualized instruction, students will follow particular paths through the content because of their unique abilities, interests, and plans for the future. In such cases, it is only reasonable that provisions be made within the instructional system to assign graduates to the appropriate next step.

Each of the variable-treatment models (Figures 4, 6, 8, and 10) includes an optional "embedded-test" loop as part of the treatment. This is included to encourage designers to take full advantage of the opportunities offered by multiple-treatment models. It is optional because the instruction can take place without it, it may be expensive to develop, and it increases the load on instructional management. The rationale behind the embedded-test loops is that it is worth verifying the choice of instructional treatment early in instruction so that changes can be made in time for their effects to be seen in improved performance. The process simply calls for a progress check early in instruction. If the student is progressing at a reasonable rate nothing changes. But if the treatment is not working as expected, then a change in treatment can be implemented early.

Each of the variable-treatment models also includes a non-optional diagnostic pretest. The diagnostic pretest is specifically designed to suggest an instructional treatment; it is not an exemption test. Diagnostic pretests may assess reading ability, media preferences, previous experience directly related to the instruction, and other characteristics which can be helpful in choosing a treatment. Notice that the results of the diagnostic pretest feed directly into the process of choosing and assigning an instructional treatment.

All of the models include post-tests. As they are written, the flowcharts imply that post-test decisions are made on an objective-by-objective basis. A problem similar to that noted in the exemption pretest can therefore arise with the post-tests. Not all instructional system applications can operate at the single-objective level for decision making. For those cases where objectives are grouped into instructional units, the flowcharts should be read as if decisions keyed to single objectives are actually keyed to the functional groups. A similar change in interpretation is necessary if the entire course must be treated as a unit. Notice that as the number of objectives considered simultaneously grows larger, from each objective by itself to all of the objectives as a single group, the opportunities to accommodate individual differences decrease. A compromise is necessary between the management problems of individual-objective decision making where the number of decisions becomes unreasonable, and the overly rigid, single end-of-course decision.

Each of the fixed-time models has "time available" decision diamonds occurring at two points where the model iterates to the process of instruction. These decision diamonds explicitly recognize the heavy time-dependence implied by the fixed-time models. If the instruction is well planned to fit within the given time, and if unexpected problems with the instruction or the students do not arise, then the decisions will not cause problems. In each case, the answer will be "yes, time is available," and the flow will continue uninterrupted. However, if the answer is "no, all the time is used up," the flow runs into a dead end. There is no provision in these instructional systems models for the case where time runs out. The process simply stops. In considering applications of fixed-time instructional systems models, designers and managers should be aware that this problem exists and should consider how they will respond if it occurs.

All of the flowcharts contain one or more (more in the case of variable treatment models) boxes labeled "instruction". It is at this point that the discussion of instructional models overlaps ISD procedures to a very great degree. In fact, if the ISD procedures are followed, each of the 16 generic models can be the common skeletons for a wide variety of instructional models specifically designed to meet a particular training and training management need. The relevant sections of ISD are Block III.1, Specify Learning Events/Activities and Block III.2, Specify Instructional Management Plan and Delivery System.

Block III.1, Specify Learning Events/Activities, is primarily concerned with the basic instructional design to be developed. It consists of four steps: Identify General Learning Guidelines, Classify Each Learning Objective According to Category and Sub-Category of Learning, Identify Specific Learning Guidelines for Each Sub-Category of Learning, and Specify Learning Activities. Since it is assumed that the reader is generally familiar with the ISD materials, no details will be provided here. There are, however, several important points to be highlighted. First, the four ISD steps apply equally well to all 16 of the generic models. Second, through the guidance provided, ISD allows one to elaborate in considerable detail the learning activities and options that are most likely to lead to student learning. Third, the detail gained through the use of the ISD procedures can improve planning for effective instructional management.

For example, imagine that the bulk of a set of objectives described learning which fell into the "Rule Learning and Using" sub-category. In addition to the ISD guidelines common to all instruction -- (1) inform the learner of the objectives, (2) provide for active practice, (3) provide guidance and prompts for the learner, and (4) provide feedback to the learner -- this sub-category suggests that certain other activities take place. Some of the more important activities are: insuring that trainees know the basic concepts behind the rules they are to learn, providing remedial instruction to those who need help, teaching in each rule independently, training in selecting the correct rule and applying it, and anchoring the example to real-world problems to encourage transfer.

These guidelines can be applied to the design of instruction within any of the generic models. They also contain a number of implications for the models. For example, regardless of the model, a pretest based on prerequisite concepts must be a part of the instruction. For a variable-treatment model such a test would probably be incorporated into the diagnostic test since the results would probably influence the choice of instructional treatment. For the fixed-treatment models, such a pretest would represent an addition to the basic flow. The guideline that rules be trained independently suggests that if the exemption pretest loop is chosen it can be implemented on a rule-by-rule basis. This also implies that it might be useful to consider a management system that permits a variety of activities (in this case, different rules being learned) to occur simultaneously. One more example of the implications of the ISD guidelines in this case is that if a fixed-time model is chosen, the time available must accommodate the probable need for remedial training for some of the students. Other sub-categories and mixes of sub-categories of learning will, of course, suggest other courses of action.

ISD Block III.2, Specify Instructional Management Plan and Delivery System, continues the process of providing detail to the model. Four steps occur in this block: Select Pool of Media Mixes, Make Media Selection, Determine Management Guidelines, and Develop System Master Plan. ISD Block III.2 also shows, through the procedures suggested, how the instructional contexts and the factors affecting those contexts (see Chapters II and III) bear on instructional design.

The ISD procedures provide very detailed guidelines for choosing instructional media. Through a series of charts keyed to the type of learning implied by each objective, and the particular stimulus conditions required by the context of each objective, media suggestions are made. Step 1 of Block III.2 is the process of selecting candidate media for each objective. Step 2 of Block III.2 is the process of making final media choices. The media choice will be partly a function of how well one or more media generalize to all of the objectives. It will also rely on the implications of the instructional context and factors. For example, if instruction is to take place outdoors in an operational setting, then elaborate audiovisual equipment would probably not be advised. The consideration of contexts and factors can aid in the ISD process as the ISD process aids in better defining the instructional system.

The third and fourth steps of Block III.2 draw even more heavily on the factors considered in the earlier discussion of instructional contexts. These two steps, in effect, operationally define the instructional system by outlining the management required to make the model work. Some of the issues which must be dealt with are: specifying who is in charge of course management; scheduling of facilities; control of students; making provisions for differences in student abilities; the types, roles and numbers of instructors and other professional staff, facilities and equipment, and consumables and courseware. In other words, all of the detail required to make a course work.

The instructional contexts discussed in Chapter II and Chapter III and the generic instructional models described in this chapter can provide a general framework for applying ISD procedures. It seems likely that the choice of a generic model will occur very early in the planning for new instructional development simply because the dimensions on which the models are classified are very general. As the ISD Block III.1 and Block III.2 procedures are applied in operationalizing the generic model, it will become clear whether a change is required. However, since the ISD procedures and the generic models are complementary and do not constrain one another, it is neither costly nor inconvenient to experiment and explore alternative configurations in order to find the best approach to a particular instructional problem.

Discussion of the Models

In this section each model is briefly discussed. The component parts of the models have been described in some detail so they will not be addressed in the context of the individual models. Rather, a more wholistic view of each model will be presented.

Fixed-Time Models

Figure 3 presents the fixed-treatment, fixed-objectives, fixed-time models. Model 1 has fixed proficiency and Model 2 has variable proficiency. Model 1 is very restrictive and presents difficult problems for individualization. All students are expected to reach the same proficiency in the same time with the same instructional treatment. This is only likely to be possible if groups of students are kept small, if the treatment provides a lot of individual help, and if the students are homogeneous in ability. The master gunnery program, as represented by Target Acquisition and Identification (see Appendix A), is a good example. The class sizes are small and the classes are conducted by a master gunner. It seems reasonable to assume that a tutorial atmosphere could exist, allowing students the opportunity to get individual help. Homogeneity is assured since students are prescreened by their superiors before beginning the instruction. Thus, even under this restricted model, good instruction can be implemented if careful attention is paid to detail.

The change from fixed to variable proficiency in Model 2 can dramatically change the instructional system depending on how variable proficiency is implemented. If variable proficiency is accepted as a consequence of the constraints placed on instruction by the other dimensions being fixed, then Model 2 describes most traditional instruction. That is, in most classrooms all of the students are taught the same way for the same amount of time, and they perform to different levels of proficiency. Their performance differences usually lead to differences in what they do subsequently; they continue with training, drop out, repeat. It may also be possible, however, to take a more active approach to variable proficiency. For example, the different gunnery ratings allow for variable proficiency, but they also set definite minimum standards. If the pretest option is chosen, it may be possible to set proficiency levels based on the entry behavior of students. For example, students already skilled might be expected to perform to higher levels than novices. Creative ideas will be necessary to provide high quality individualized instruction under the constraints of Model 1 and Model 2, but there is no theoretical reason why it cannot occur.

Figure 4 illustrates Model 3 and Model 4, the variable-treatment analogues of Model 1 and Model 2. Providing variable instructional treatments as a function of individual abilities, learning, styles, previous experience, or preferences can be very effective. For example, technical maintenance manuals have a tendency to be difficult to read. Supplementary material, in various forms, could be made available to students to help them with the manuals. The particular choice of supplementary material would depend on the student. More elaborate differences in treatments are also possible. Some students might begin with hands-on training and lectures or tutorials and rely very little on manuals while other students used some sort of mock-up and made much heavier use of the manuals. The choice of treatment would depend on the student. For treatments that are very expensive, such as individual on-the-job training, assignment to that treatment might go only to the students who could not reach the instructional goals any other way. Variable-treatment models have, in general, not been well researched because the research tends to be difficult and expensive. However, given the importance of adapting instruction to a wide variety of Armor trainees, they may be models which bear serious consideration in the future.
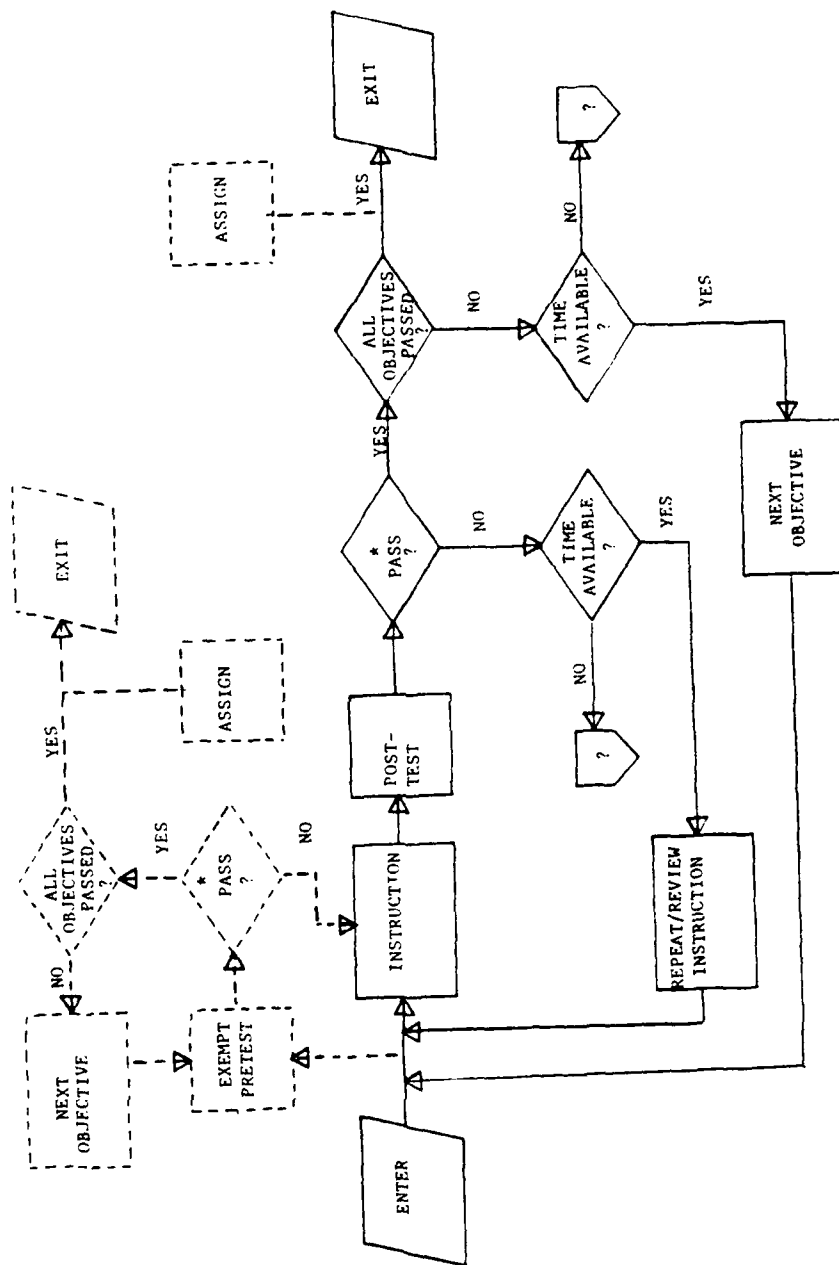
FIGURE 3

Model 1: Fixed Treatment, Fixed Proficiency, Fixed Objectives, Fixed Time
Model 2: Fixed Treatment, Variable Proficiency, Fixed Objectives, Fixed Time

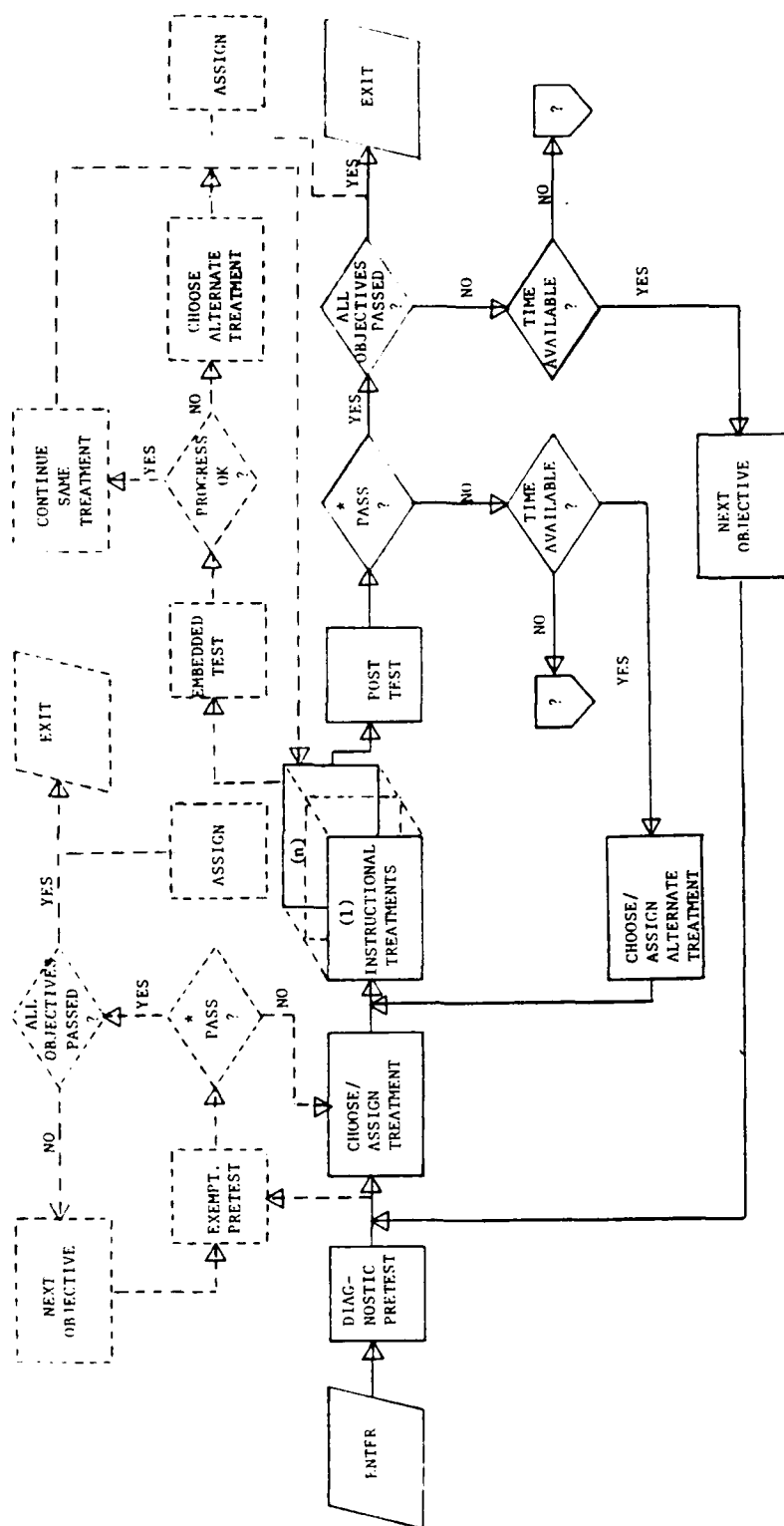*Passing criteria are constant for all trainees in Model 1; passing criteria may vary in Model 2.

FIGURE 4

Model 3: Variable Treatment, Fixed Proficiency, Fixed Objectives, Fixed Time
Model 4: Variable Treatment, Variable Proficiency, Fixed Objectives, Fixed Time

*Passing criteria are constant for all trainees in Model 3; passing criteria may vary for Model 4.

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Figure 5 illustrates Model 5 and Model 6. In these two models treatment is fixed, but objectives are permitted to vary from student to student. Variable objectives provide an alternative to variable treatments as a method to individualize. Within Model 5, with fixed proficiency, trainee *differences* would probably be reflected in the number of objectives they were able to complete in the allotted time. If trainee skills were determined in advance, a list of objectives matched to the needs of each trainee could be assigned. If such pretesting were not possible, the ordering of the objectives for presentation to the trainees should start with the most critical objectives so that all trainees would be exposed to them. The least critical objectives would be reached only by the most able students. Model 6 adds variable proficiency. The combination of variable proficiency and variable objectives would result in a very flexible system. For example, the proficiency required for critical objectives might be set high, while the proficiency for less critical objectives could be allowed to drop. In this way, the less able trainees might be able to gain some proficiency in a greater range of objectives than in the case of the fixed-proficiency models simply because their required proficiency on these objectives would be permitted to drop to some degree. Applications of variable objectives models are not commonly found in the literature. They may, however, provide a relatively inexpensive and easily implemented approach to individualization, especially when they are coupled with variable proficiency as in Model 6.

Figure 6 presents the most complicated of the fixed-time models. Model 7 incorporates variable objectives and variable treatments. Model 8 includes variable proficiency so that only the time dimension is fixed. But these models allow great flexibility in individualization. They incorporate all of the possibilities of the simpler models as well as the even greater opportunities of combined variable dimensions. One problem with these models, however, is that they may be too complex, with too many possibilities and management demands, to be *economical*. It may be worthwhile to gain experience with variable objectives and variable treatments in separate instructional development efforts and then combine them in the form of Model 7 and Model 8.

Variable-Time Models

Figures 7 through 9 contain the variable-time models. Variable time adds the important possibility of self-pacing to the previously described models. Self-pacing removes much of the rigidity of the earlier models and permits much greater individualization. On the other hand, self-pacing significantly increases the demands of instructional management. Despite the greater difficulty of implementing variable-time models relative to fixed-time models, self-pacing is usually the first choice of a means of individualization.

Figure 7 shows Model 9 and Model 10. These models have fixed objectives and treatments and Model 9 has fixed proficiency. In fact, with the exception of self-pacing, Model 9 is identical to the very rigid Model 1. Yet it is probably the most common form of individualized instruction to be found. In many implementations the form of instruction used with Model 9 is some type of self-instructional package such as a programmed text, computer-assisted instruction, or detailed study guides and practice exercises accompanying a traditional text. With such materials, students can continue to study until they master the objectives.
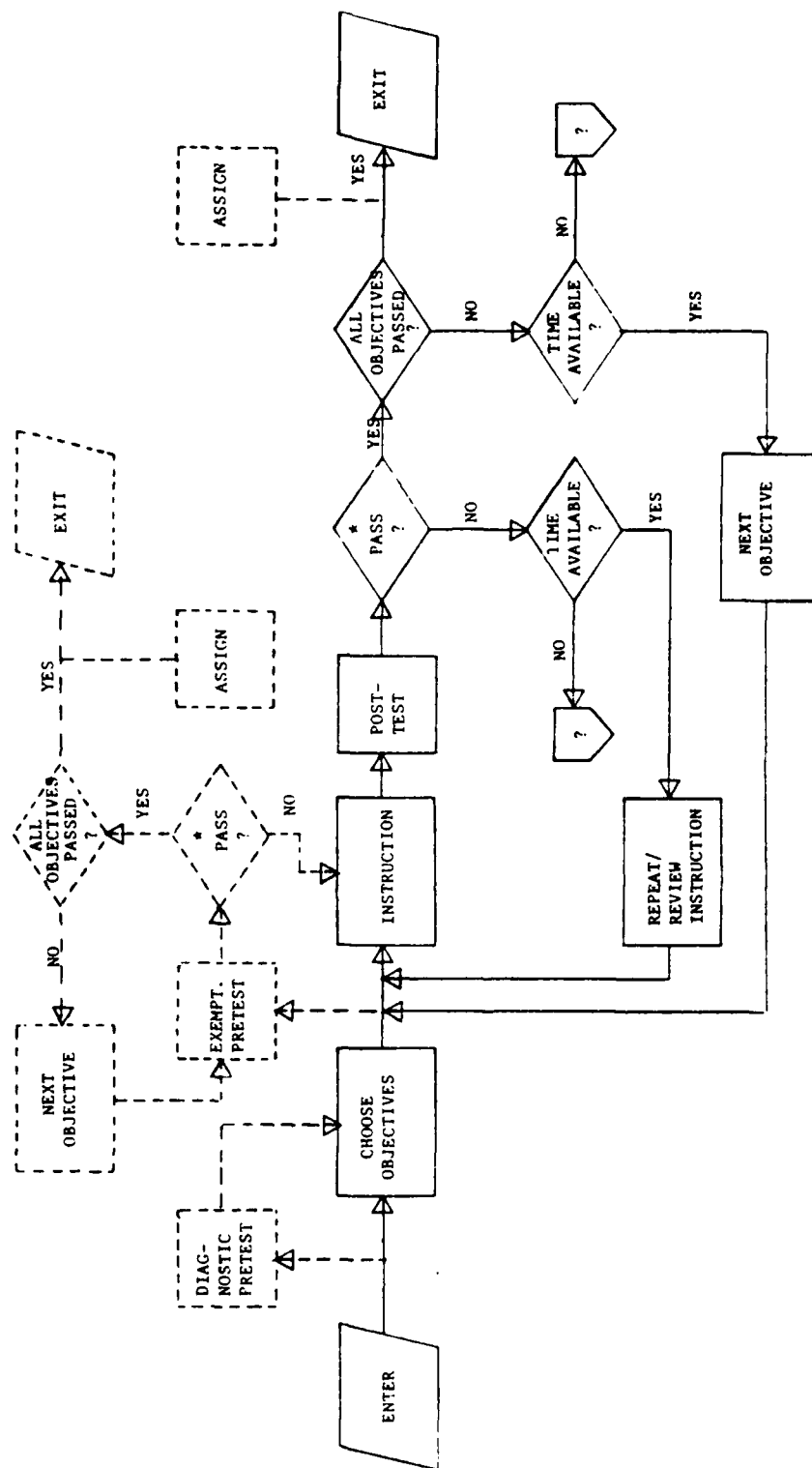
FIGURE 5

Model 5: Fixed Treatment, Fixed Proficiency, Variable Objectives, Fixed Time
Model 6: Fixed Treatment, Variable Proficiency, Variable Objectives, Fixed Time

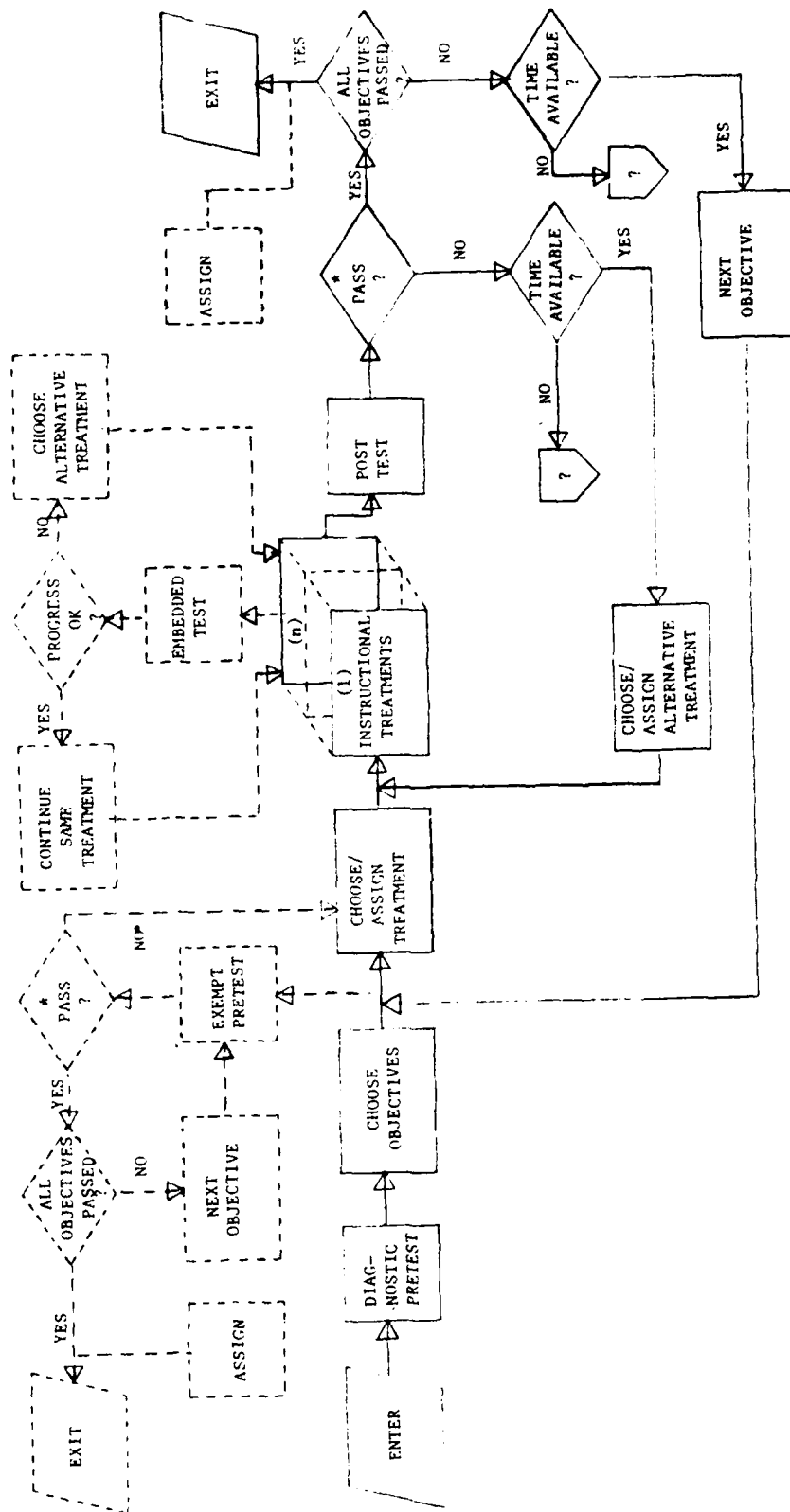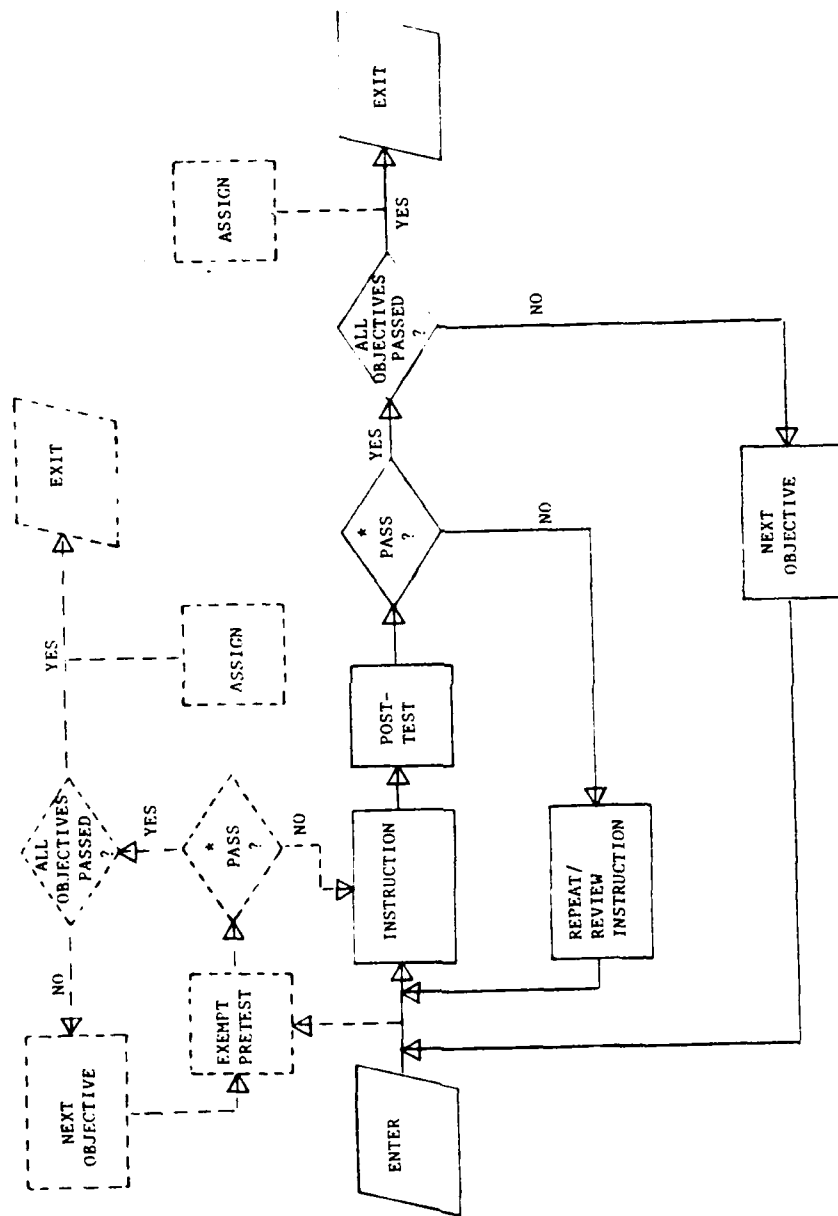*Passing criteria are constant for all trainees in Model 5; passing criteria may vary in Model 6.

FIGURE 6

Model 7: Variable Treatment, Fixed Proficiency, Variable Objectives, Fixed Time
Model 8: Variable Treatment, Variable Proficiency, Variable Objectives, Fixed Time

*Passing criteria are constant for all trainees in Model 7; passing criteria may vary in Model 8.

FIGURE 7

Model 9: Fixed Treatment, Fixed Proficiency, Fixed Objectives, Variable Time
Model 10: Fixed Treatment, Variable Proficiency, Fixed Objectives, Variable Time

*Passing criteria are constant for all trainees in Model 9; passing criteria
may vary in Model 10.

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Many applications of Keller Plan (PSI) instructional systems are illustrative of Model 10, which expands on Model 9 with the addition of variable proficiency. In these applications the instruction is in the form of self-instructional materials and tutors or proctors. Note that although two media are used, self-instructional materials and human tutors, the model is not a variable treatment model because all students are exposed to the same two media in about the same way. Model 10 differs from Model 9 in that students can achieve the objectives to different levels of proficiency. Thus, one finds students who reach minimum criteria and get a minimum passing grade, while those who exceed the minimum criteria are suitably rewarded. In most cases the students themselves decide how hard they want to work and, hence, what criterion level or proficiency they will achieve.

The relatively large literature discussing applications of Model 9 and Model 10 make it clear that variable-time models can be implemented in formal instructional settings. They are not restricted to individual, independent study settings. However, the literature also makes it clear that careful attention must be paid to instructional materials development, especially formative evaluation (ISD Blocks III.4 and III.5), and management in order for the system to work properly and successfully.

Model 11 and Model 12 are shown in Figure 8. These models expand on Model 9 and Model 10 by adding variable treatments. Much of the current theoretical literature addressing aptitude-treatment interaction (ATI) phenomena and instructional materials development suggests that these types of models are representative of the direction that the field should be moving in. These models combine the flexibility afforded by self-pacing with the direct accommodation to individual differences characteristic of variable-treatment models. As the theory pertaining to ATI becomes more developed, and workable management systems designed to assign students to appropriate treatments become available, these models should begin to replace the currently popular, but more limited, Model 9 and Model 10.

Model 13 and Model 14, shown in Figure 9, combine self-pacing with variable objectives. These models are likely to see application only in conditions where trainees are given considerable freedom to choose their own programs of study or training. This is true because self-pacing permits the system surrounding the instruction to demand that all required objectives be completed; that is, for required objectives Model 9, Model 10, Model 11, and Model 12 are appropriate. Thus, the variable-objectives models with variable time, Model 13 and Model 14, would be appropriate only where trainees, not the systems, choose the objectives. While these models certainly enhance individualization from the students' point of view, they are not as important a method from the overall system's point of view as the fixed-time, variable-objectives models, Model 5 and Model 6.

Finally, Figure 10 illustrates Model 15 and Model 16. In Model 15 all of the dimensions except proficiency are variable. In Model 16 all of the dimensions are variable. These models have the same problems as Model 7, Model 8, Model 13, and Model 14. Like Model 7 and Model 8, they are very complicated and very possibly too complex to be worth the small addition in flexibility offered relative to the other variable-time models. Like Model 13 and Model 14, they are not likely to be necessary except in those situations where students are given a large amount of control over their instructional programs. Where
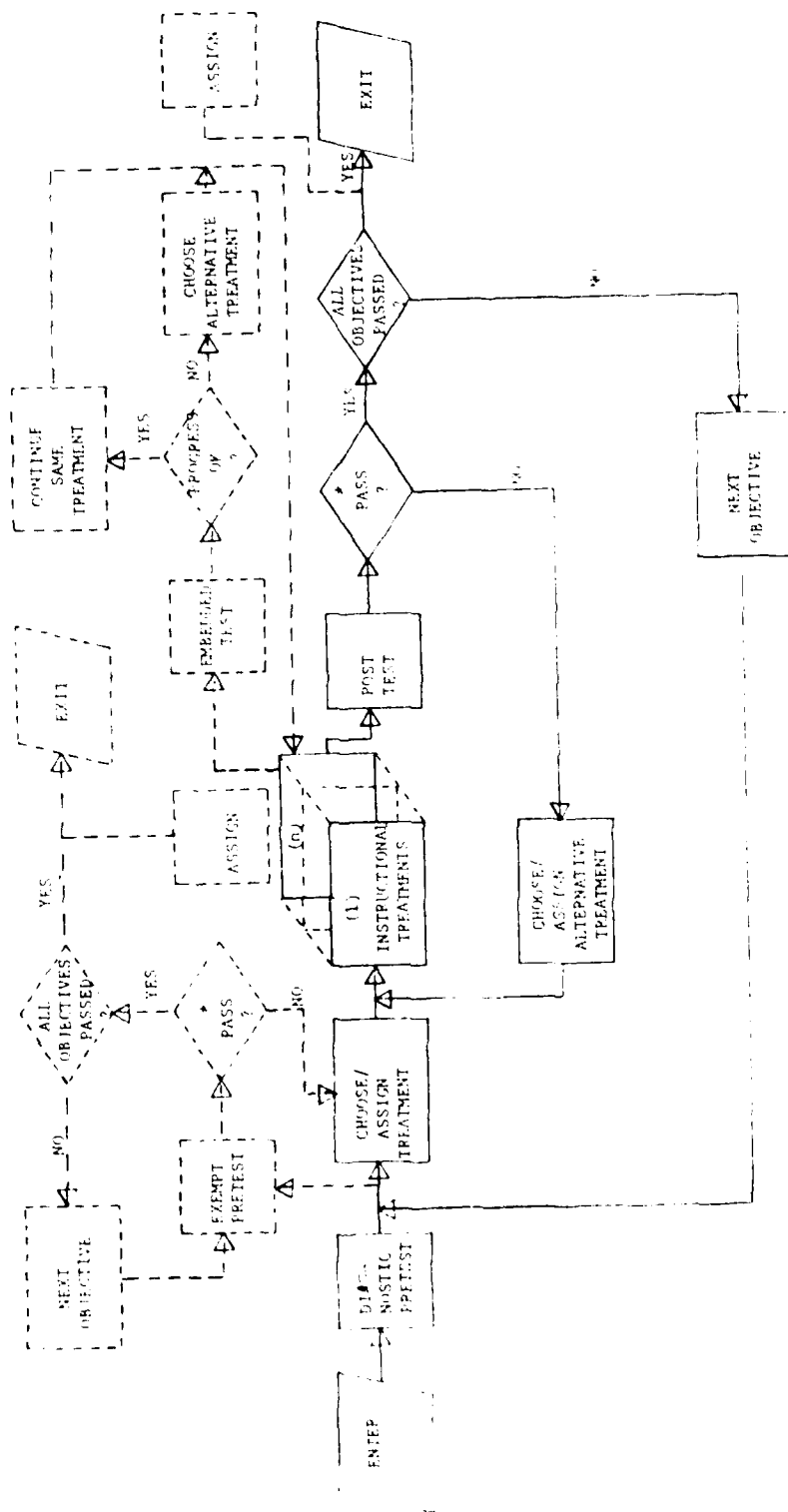
FIGURE 8

Model 11: Variable Treatment, Fixed Proficiency, Fixed Objectives, Variable Time
Model 12: Variable Treatment, Variable Proficiency, Fixed Objectives, Variable Time

*Passing criteria are constant for all trainees in Model 11; passing criteria may vary in Model 12.
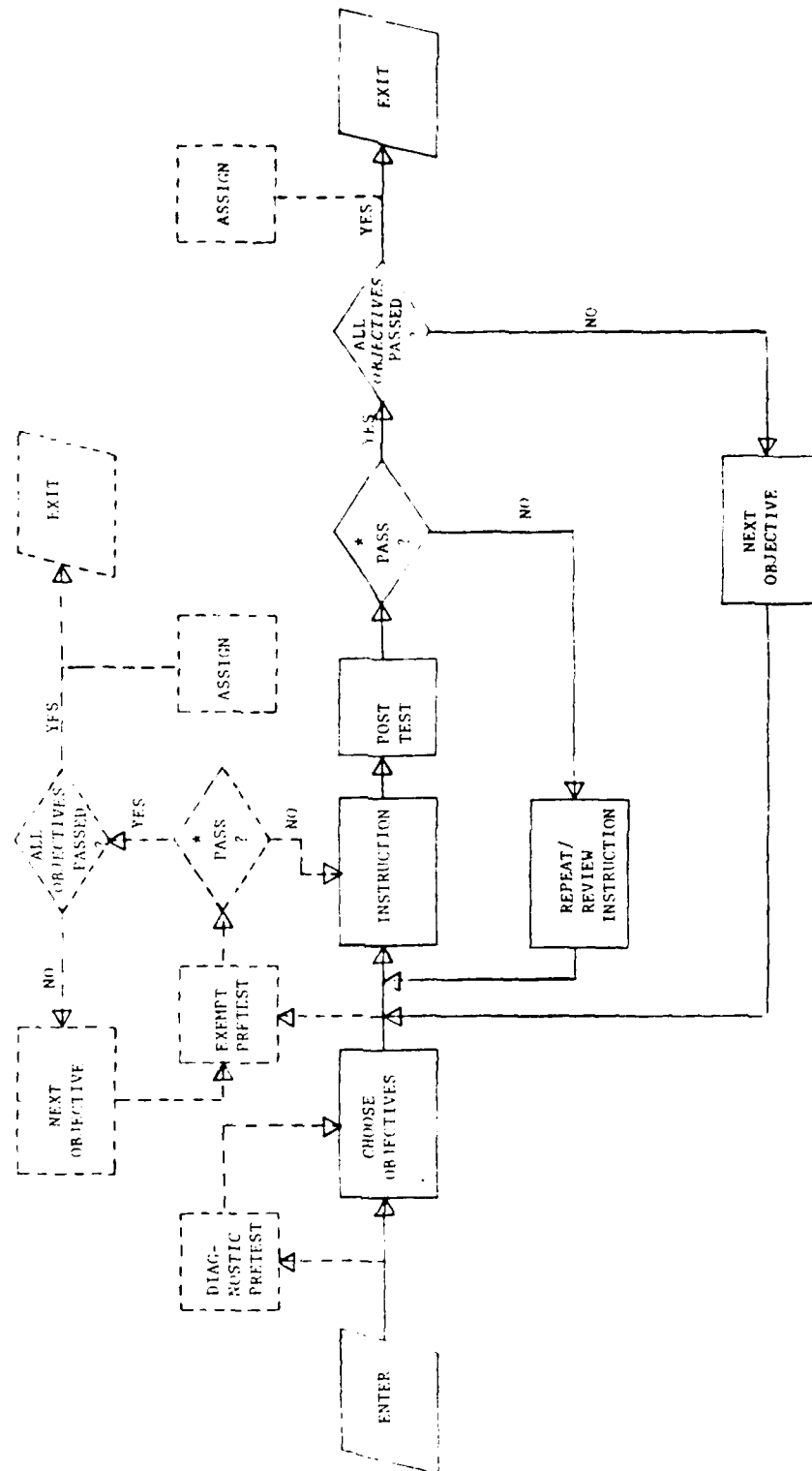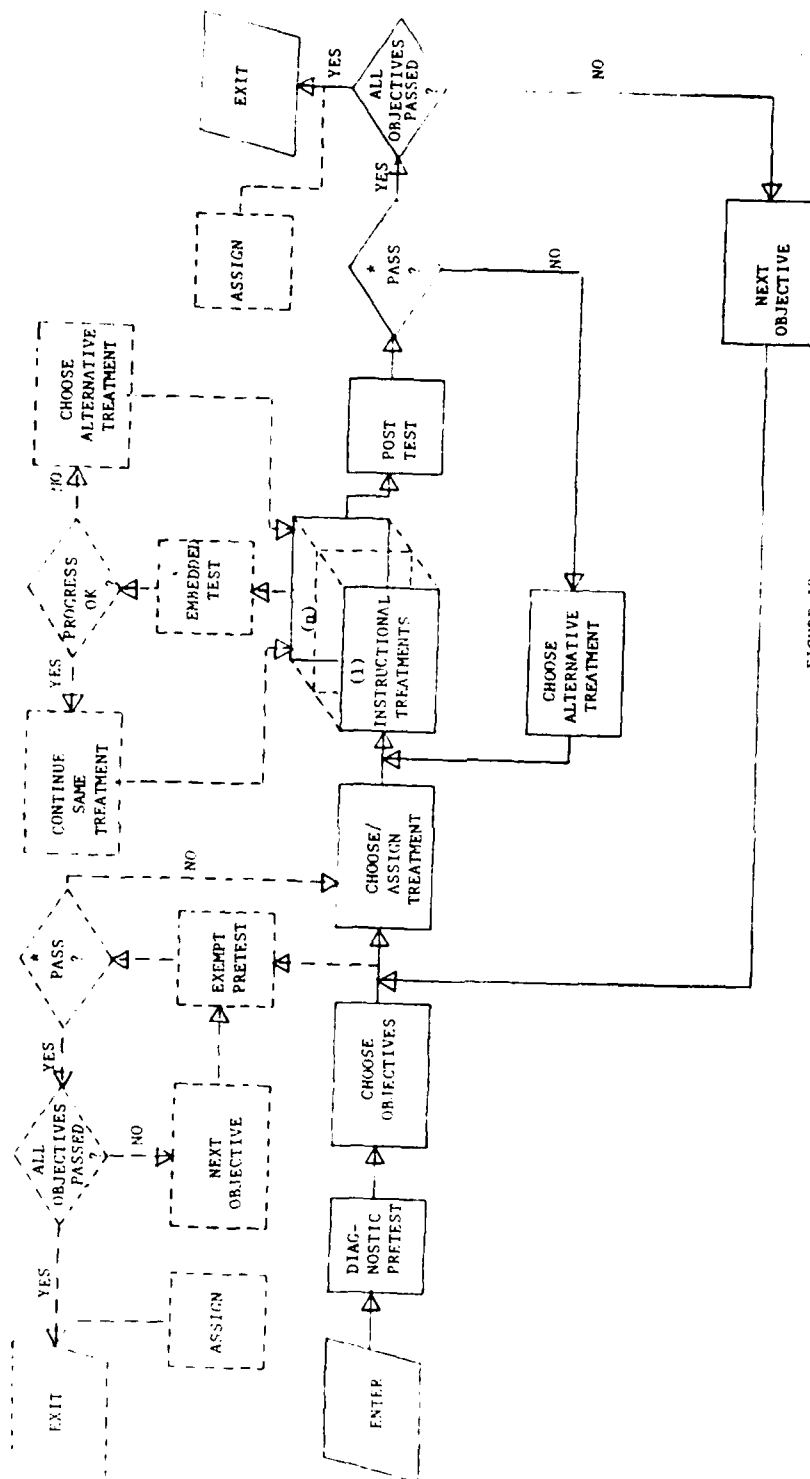
FIGURE 9

Model 13: Fixed Treatment, Fixed Proficiency, Variable Objectives, Variable Time
Model 14: Fixed Treatment, Variable Proficiency, Variable Objectives, Variable Time

*Passing criteria are constant for all trainees in Model 13; passing criteria may vary in Model 14.

FIGURE 10

Model 15: Variable Treatment, Fixed Proficiency, Variable Objectives, Variable Time
Model 16: Variable Treatment, Variable Proficiency, Variable Objectives, Variable Time

*Passing criteria are constant for all trainees in Model 15; passing criteria may vary in Model 16.

the system has definite needs, expressed as instructional objectives and a desire to implement a variable-treatment model, Model 11 and Model 12, with variable time and variable treatment, will suffice. Therefore, these last two models, while evoking some theoretical interest because of the flexibility they provide, are not likely to see much application.

The Selection of Models

Choosing which of the generic models to use in a particular application will involve consideration of the parameters and constraints of the context of instruction. The discussions in Chapters II and III and the earlier pages of this chapter should provide the background necessary to analyze each potential application. A thorough understanding of the ISD procedures will also be useful.

The choice of which of the 16 generic models applies actually reduces to four questions. One question corresponds to each of the four dimensions of the models, the implications of which were discussed in detail earlier. Therefore, each dimension will only be highlighted here with respect to choosing a model.

The Time Dimension

The question about the time dimension reduces to whether time will constrain learning or be permitted to expand and contract as a function of learning. Nearly all instruction takes place within some time constraints, of course, but in a fixed-time model, the time is an overriding factor controlling both the delivery of instruction and learning. Material is presented at a particular rate, regardless of the differences among students, and at the end of the allowable time instruction stops. In a variable-time model, students are permitted to move through the instructional materials at the rate best for each individual student. Some students will move quickly, others more slowly, and some quite slowly. Nevertheless, the average time to complete the instruction under a variable-time model is likely to closely approximate the time allotted in a carefully planned and researched application of a fixed-time model. The first decision in choosing a generic model yields fixed time or variable time.

The Proficiency Dimension

The choice of whether proficiency should be fixed or variable is partly a matter of philosophy and partly a matter of needs. If the prevailing philosophy is one that holds that a single proficiency level, often mastery, is the only meaningful quantity to measure and aspire to, then fixed proficiency is indicated. Such a philosophy implies not only that sub-criterion performance is unsatisfactory but also that performance above criterion is not necessary. This might often be the case in man-machine systems where sub-criterion human performance degrades system performance and where machine constraints suggest that human performance above criterion makes no difference to system performance. The opposing philosophy dictates that there are several meaningful levels of proficiency and that it is useful to discriminate among persons on the basis of their relative proficiency. In this case, a variable-proficiency model is appropriate. Needs dictate fixed or variable proficiency in a manner similar to the dictations of philosophy. Thus, if the training leads to a job

in which all tasks are critical, a high fixed-proficiency level is required.
For other cases, a variety of levels of expertise might be acceptable. In these
cases, a variable proficiency model could be implemented. The second decision
in choosing a generic model yields fixed proficiency or variable proficiency.

The Objectives Dimension

The considerations leading to a choice of fixed or variable objectives
parallel those for fixed or variable proficiency very closely. If the system's
philosophy and needs permit flexibility in what trainees must be able to do as
a function of training, then a variable-objectives model may be appropriate.
Note that the variable-objectives feature does not necessarily apply to all ob-
jectives. In fact, many applications are likely to have a core of required ob-
jectives and a list of supplementary objectives from which an individualized
program can be built. If, on the other hand, the system is such that all
trainees must be able to do all of a collection of objectives, then a fixed-
objectives model is required. Many Armor training programs are likely to fit
the conditions of a fixed-objectives model simply because such training programs
are typically constructed around a pool of objectives that has been screened to
include only those most critical to the job. In addition, most training pro-
grams also cannot afford the time to permit trainees to go beyond those critical
objectives included in the training. The third decision in choosing a generic
model yields fixed or variable objectives.

The Treatments Dimension

The choice of fixed or variable treatments is likely to be mostly a matter
of the time, money, and instructional design expertise that can be brought to
bear on an instructional design project. Fixed-treatment models require that
one set of instructional materials be developed, validated, ard implemented.
Variable-treatment models require that the instructional design process be re-
peated for as many treatments as the system calls for. In addition, a diagnos-
tic test must be developed to allow trainees to be assigned to the appropriate
treatment. While the theoretical literature and the small amount of empirical
data suggest that variable-treatment models can produce excellent results in
individualized instruction, the designers or managers of each system must decide
whether the additional investment is worth it for their particular case. The
fourth decision in choosing a generic model yields fixed treatment for all
trainees or variable treatment, depending on the training needs.

The Context-Model Relationship

As a result of the four decisions discussed, one cell in the generic model
matrix will be identified, and that cell could be chosen as the tentative model
for implementation. As a practical matter, however, and as will be explained
below, each cell (i.e., each class of instructional contexts) will most likely
suggest a set of alternative models rather than only one. Thus, even though
further development of the instructional system may indicate that a change in
the model is necessary, such a change is not to be viewed as a serious problem
in most cases. This discussion has emphasized the flexibility in the approach
taken to the definition of generic models. The flexibility should be extended to
use of this approach to implement the most effective model for each application.

So far, the discussion of the choice of a generic model has made no effort to tie that choice to a particular instructional context because, for the most part, one-to-one links from the cells of the context matrix to those of the model matrix do not exist. The models and the contexts are complementary, however, and decisions about one influence decisions about the other to a greater or lesser extent. The one exception to this lack of direct links is that the time dimension of the context matrix maps onto the time dimension of the models directly. That is, if the context is variable time, then a variable-time model should be chosen. If the context is fixed time, then a fixed-time model is indicated. The focus of instruction, however, (equipment, technique, or knowledge) has a much more restricted influence on the choice of a generic instructional model. There is no reason why any of the models could not accept any focus, though the parameters and constraints associated with each category of the focus dimension do have some implications for the selection of models. Focus will, however, be very useful in designing the instructional treatment or treatments. Careful consideration of focus will make the ISD procedures in Block III.2 much easier and will do much to insure that the mesh of context, model, and ISD is tight.

The instructional setting (operational, instructional-outdoor, instructional-indoor, and independent) falls somewhere between time and focus with respect to its link to the generic models. The relationship between settings and models is not one of cause and effect, but rather one of constraints and needs. For example, an independent setting is most likely to provide the environment necessary for the very flexible models incorporating several variable dimensions and is probably most likely to require flexibility in order to meet the needs of students. An operational setting, on the other hand, with the constraints associated with the operation itself, is more likely to require a rigid, fixed-dimension model. In considering the choice of generic model, the setting and the factors operating on that setting should certainly influence the decision, but as considerations rather than absolutes. Thus, the parameters and constraints associated with each category of the setting dimension also have implications for the selection of models.

The function of Table 4 now becomes apparent. The classification of a context of instruction leads to an examination of all parameters and constraints that appear to be associated with that context and then to a consideration of the implications of that context for both the selection of models and the design of instruction. One or more suitable generic models can then be selected and the design of instruction begun.

It will be noted that the implications for the selection of models given by the time dimension (Table 4, Part C) are clear-cut and unqualified. The implications given by the other dimensions, however, (the Setting Dimension, Part A, and the Focus Dimension, Part B) are judgmental. The constraints of the operational setting, for example, are severe enough that a variable-treatments model of instruction simply does not seem reasonable, while the nature of the tasks learned in contexts including the equipment focus seems to argue for fixed-proficiency models.

This procedure for the classification and description of the contexts of instruction and the selection of generic models of individualized instruction for those contexts does not envision that instructional designers will attempt to closely emulate or replicate existing successful systems of individualized

instruction, but it is certainly worthwhile to consider such systems for whatever guidance they may offer for the design of instruction. The generic models of individualized instruction presented here are, after all, forms without content, and it is useful to see what these forms become with the content and other specific features added.

Below is a list of the systems of individualized instruction described in Part I of this report. The name of each system is preceded by an abbreviation that identifies the system in Figure 11:

o   AIS -- Air Force Advanced Instructional System

o   CTS - Computerized Training System

o   IETS - Individual Extension Training System

o   IPI - Individually Prescribed Instruction

o   PSI - Personalized System of Instruction

o   TTM - Tank Turret Mechanic Course

Figure 11 is a reproduction of Figure 9 in Matlick et al. (1979). The abbreviations above have been added to show which systems may be considered to be examples of which generic models. Parentheses indicate that the system in its present form probably is not an example of the indicated generic model but would be if it were modified to include variable treatments. An asterisk indicates that a system in at least one of its forms is probably an example of the generic model indicated. Note that all of these systems are primarily examples of variable-time generic models. Only IPI, because it is typically employed in elementary schools, must therefore operate within fixed-time boundaries, and presumably does not manage to get all students through all objectives, is a possible example of a fixed-time generic model. Systems of individualized instruction based on mastery learning strategies (see Matlick et al., 1979, under Instructional Methods) probably would be examples of fixed-time generic models, but none were identified during the review of the literature.

It is immediately apparent that the figures in Matlick et al. (1979) that represent the management of the systems listed above (Figure 4 and Figures 10 through 11) are somewhat more complex than the figures which represent the generic models. This is true primarily because the generic models do not elaborate instruction, but within each system-management flowchart the structure of the underlying generic model may be traced out.

It may also be useful to see at a glance the applicability of the generic models of individualized instruction to the various contexts of instruction given by the classification matrix. Table 5 is a reproduction of Table 2 in this part. Each cell of Table 5 lists the generic models implied by the various parameters and constraints attending that cell. Table 5 represents, to some extent, the judgments of the authors, of course, but each model selection in the table may be verified against the implications of Table 4. Furthermore,

		FIXED		VARIABLE	
		FIXED	VARIABLE	FIXED	VARIABLE
FIXED	FIXED	1	2 (Most common methods of instruction)	3	4
FIXED	VARIABLE	5	6	7 IPI*	8
VARIABLE	FIXED	9 CTS TTM	10 PSI	11 AIS IPI PSI* (CTS) (TTM)	12
VARIABLE	VARIABLE	13 IETS	14	15	16

Diagonal axis labels: TREATMENT, PROFICIENCY, OBJECTIVES, TIME

Figure 11

Instructional Systems as Examples

of Generic Models

TABLE 5

IMPLIED GENERIC MODELS

* = Probably only in institution

	TIME: Variable (I) (Time is function of learning) SETTING				TIME: Fixed (H) (Learning is function of time) SETTING			
FOCUS	Operational (A) Armor tasks under prescribed conditions	Instructional, Outdoor specifically designed for instruction (B)	Instructional, Indoor specifically designed for instruction (C)	Independent (D) Learning with little or no supervision	Operational (A) Armor tasks under prescribed conditions	Instructional, Outdoor specifically designed for instruction (B)	Instructional, Indoor specifically designed for instruction (C)	Independent (D) Learning with little or no supervision
Equipment (E) (Nomenclature, maintenance, etc. of equipment)	M9 M13	M9 M11 M13*	M11 M15*	M11 M15*	M1 M3 M5	M1 M3 M5*	M3 M7*	M3 M7*
Technique (F) ("How to" aspect of combat)	M9 M13	M9 M10 M13 M14	M11 M15	M11 M15	M1 M5	M1 M2 M5 M6	M3 M7	M3 M7
Knowledge (G) (Not a direct antecedent of performance)	M9 M10 M13 M14	M9 M10 M13 M14	M9 M10 M13 M14	M11 M12 M15 M16	M1 M2 M5 M6	M1 M2 M5 M6	M1 M2 M5 M6	M3 M4 M7 M8

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it must be kept in mind that the models shown are only implied by their contexts and that any fixed-time model is at least a possibility for any fixed-time context and any variable-time model for any variable-time context. As the design of instruction proceeds, however, the implications of the contexts for the design of instruction would almost certainly result in one or two models within any set emerging as best choices.

To clarify the assignment of models to Table 5, consider the cell given by the intersection of the operational setting (A) and the focus on equipment (E) under fixed time (H). This cell identifies context class AEH. Table 4, under A. The Setting Dimension, shows that for the operational setting treatments should probably be fixed (because of the limits on facilities, instructors, and management capability), objectives could be variable (because most tasks are collective and soldiers at different skill levels would be trained at the same time), and proficiency should be fixed (simply because an operation is in progress and proficiency is controlled by doctrine). Thus, on the basis of the setting above the models to be considered would include fixed treatment and proficiency but variable objectives. That is, only fixed treatment and proficiency would be provided, but objectives could be fixed or variable.

Under B. The Focus Dimension, Table 4 shows that for the focus on equipment variable treatments appear to be desirable and feasible (because of the low student-instructor ratios, which would apply even in the operational setting if it is assumed that maintenance training would take place during lulls in operations), objectives could be fixed or variable (fixed in the unit because tasks are easy but important; variable in the institution because personnel of broadly different MOSs might be trained at the same time), and proficiency should probably be fixed (because tasks are basically simple but important). Thus, on the basis of the focus alone the models to be considered would indicate fixed proficiency but variable treatments and objectives. That is, only fixed proficiency would be provided, but treatments and objectives could be fixed or variable.

Now it is necessary to resolve the conflict between the implications of the setting and those of the focus. This conflict occurs in the selection of the treatment variable: the operational setting points to fixed treatment, but the focus on equipment indicates variable treatment. Because the two categories are in essential agreement on proficiency and objectives, it seems reasonable to resolve the conflict by including both fixed and variable treatment models so long as variable treatment and variable objectives do not occur together. Concurrent variability in treatment and objectives would make the management of learning more difficult, and the limit on management capability was one reason why fixed treatment was implied by the setting dimension. Thus, with the conflict resolved, the models to be considered include both fixed proficiency and fixed or variable treatment and objectives so long as variable treatment and variable objectives do not occur together. The models in contention to this point are M1, M3, M5, M9, M10, and M13.

Under C. The Time Dimension, Table 4 shows that for fixed-time contexts fixed-time models (by definition) should be selected. M9, M10, and M13 are variable-time models and are thus eliminated, leaving M1, M3, and M5.

This same kind of rationale for selection, with only minor variations, applies to all the context classes. For example, in the cell given by the intersection of the operational setting (A) and the focus on equipment (E) under variable time (I) -- that is, the variable-time counterpart of the context class considered in detail above -- only M9 and M13 are listed. Model 9, of course, is the variable-time counterpart of Model 1, and Model 13 is the variable-time counterpart of Model 5. Both Model 1 and Model 5, it will be recalled, were selected for context class AEH (above). But Model 11, the variable-time counterpart of Model 3, was not selected for context class AEI even though Model 3 was selected for AEH. The reason for this is that in the presence of variable time variable treatment does not seem necessary because the usual tasks are simple and, given a reasonable amount of time, the student should be able to learn. Considering the constraints of the context class, therefore, it would probably be best to not consider a variable-treatment model.

In a limited way, the reasonableness of the models selected for the various context classes may be verified by considering the possible applications of them to the training activities classified in Table 3. As an example of this limited kind of verification, consider Gunnery -- Table VIII, under Units - Fort Carson.

The context of Gunnery -- Table VIII has been classified as AFI, and Model 9 and Model 13 should therefore be appropriate. Both of these models include fixed treatment and proficiency, but one establishes fixed objectives while the other allows objectives to vary. In the systems based on these models, objectives could be developed and sequenced so that the soldiers would receive review instruction on the skills and knowledge essential to successful firing of Table VIII, then demonstrate the skill/knowledge in dry-fire mode, and finally (the final objective in the sequence) fire Table VIII. Alternatively, soldiers who consider their skills and knowledge adequate (or whose skills and knowledge are considered adequate by the instructors) would take the exemption pretests. These pretests would consist of demonstration of the required skills/ knowledge, with live firing considered to be the final exemption pretest. Soldiers who pass the pretests -- any or all of them -- could serve as tutors to soldiers who do not pass.

Training would begin on tanks parked well behind the firing positions, and all available and appropriate devices would also be used in order to reduce queuing. Soldiers reaching the final objective would move their assigned tanks into position and fire Table VIII. The composition of provisional crews for firing would vary with the model employed.

In the case of Model 9, the assumption is that each soldier present for training will fire if he can get through all of the objectives in the available time. Thus, cross-training is implied, and as each soldier passed the next-to-last posttest (or exemption pretest) he would be assigned to a tank with an instructor (or tutor) as Tank Commander. The tank would then be moved into a firing position, and each soldier would become Gunner for a firing of Table VIII. Failure at this point would mean repeating at least some of the instructional units.

In the case of Model 13, the assumption is that not all soldiers would fire Table VIII, perhaps because of limits on ammunition or time. Thus, on the basis of one or more criteria different objectives would be assigned to

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different soldiers. All gunners might be assigned to the live-fire sequence
of objectives, for example, while loaders and drivers are assigned to other
objectives indicated by their diagnostic pretest scores. Gunners to be soon
separated might not fire, while loaders and drivers soon to become gunners
would fire.

Design of Instruction and Simulation of System

The context-classification-and-description-and-model-selection (individ-
ualization) procedures described in this volume are not considered or intended
to be separate and distinct from the ISD procedures. They are, rather, an
adjunct to those procedures, providing additional guidance as regards the de-
velopment of individualized instruction. For this reason, the details of the
development of systems of individualized instruction, while they have been amply
treated in Matlick et al. (1979) (the review of the literature), have not been
included in the individualization procedures.

As the development of systems of individualized instruction proceeds --
with the ISD procedures at one hand and, perhaps, the individualization proce-
dures at the other -- computer simulation of the evolving systems may become
advisable. It may be necessary to examine the cost impacts of model selection
or system design, to determine how the model will influence both input and out-
put of students, or to test the feasibility of models and systems within per-
sonnel and resource constraints.

The generic models of individualized instruction do not, of course, pro-
vide the details required for computer simulation. The context descriptions,
while they permit estimates of such parameters as student characteristics and
subject matter types, do not add to the models sufficient detail to permit
simulation. But whether simulation is to be accomplished through MODIA (Method
of Designing Instructional Alternatives) or some more general system such as
General Purpose Simulation System (GPSS), the generic models and the context
descriptions point directly to some questions posed by the simulation technique
(What is the medium of instruction? Is the rate of assignment to the field
uniform?) and, for some questions, provide the answers (Will content be dif-
ferent for different students? Will the course be taught differently to dif-
ferent students?). Thus, if the context descriptions and generic models are
taken as a beginning, only a relative few instructional design decisions and
analyses need to be accomplished before simulation can begin.

Summary of the Individualization Procedures

This report reflects the assumptions that it will serve primarily as a
means of assessing the validity and potential usefulness of the individualiza-
tion procedures described in it and that practical use of the procedures for
the development of individualized instruction will therefore await the prepara-
tion of a procedural guide. But both as an aid to the assessment and as an
indication of what a procedural guide would entail, a summary of the individ-
ualization procedures is presented below:

o ISD procedures preliminary to the individualization procedures. Once it is known that an instructional system is to be developed -- even if it is known that an individualized system is desired or required -- development should begin without reference to the individualization procedures. The work of ISD Phase I (Analyze) and Phase II (Design), as prescribed by current ISD procedures (TRADOC Pamphlet 350-30), is concerned primarily with the content of instruction and should be accomplished without reference to the eventual shape and environment of the system of instruction. When the developer gets to ISD Block I.5, Select Instructional Setting, he may want to look ahead to the classification system of the individualization procedures, but this anticipation is not necessary. If he correctly carries out the procedures of Block I.5, the beginning of Block III.1 will be soon enough to consider the classification of the context of instruction for which he is developing a system. Again, when he develops tests in Block II.2, he may look ahead to the classification system, to Table 4, and perhaps even to the models for guidance in the selection of test-item types, but if the procedures of Phase I and Phase II are followed this forward look is also not necessary.

o Concurrent ISD and individualization procedures. When the work of ISD Phase II has been completed and work or Phase III is about to begin, the individualization procedures become highly relevant. They will provide basic information of considerable value to the developer. First, they will provide general models of instruction that the developer can use to guide his decisions about how the learning guidelines and algorithms will be implemented: that is, the descriptions of the models and the flowcharts will give him a "box" into which to put the learning activities he is considering so that he may examine them in relation to an overall instructional framework. Second, they will give the developer detailed knowledge, including real-world information, about the context in which his system must function; the design decisions he makes, especially those in Block III.2, Specify Instructional Management Plan and Delivery System, will thus be influenced by a view of reality not included in the ISD procedures. Third, the instructional models he has selected -- both descriptions and flowcharts -- will give him the beginnings of a management plan. This relationship between the individualization procedures and the ISD procedures is illustrated in Figure 12.

At the beginning of ISD Block III.1, the developer begins the use of the individualization procedures by characterizing the system under development to identify the subject(s)/tasks to be trained, who is to be trained, and the agency (institution or the units) that will conduct the training. With this basic information he can enter the individualization procedures. Next, he will determine the classification of the context(s) of the instruction. If he is
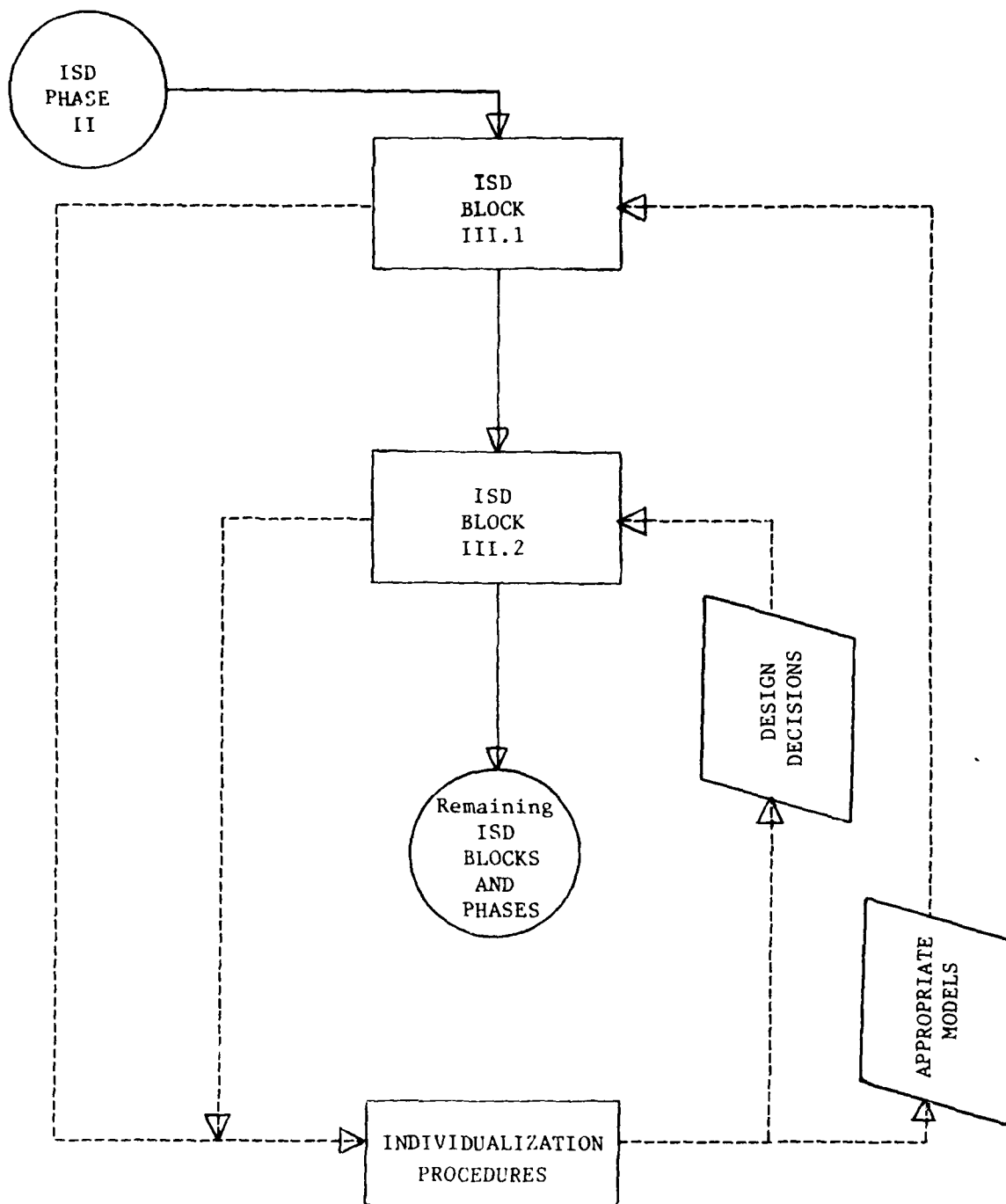
Figure 12

Relationship of Individualization and ISD Procedures

developing a system for instruction that is already being
conducted, he will be able to determine the classification
from information obtained from potential users, or he may be
able to get the classification directly from Table 3. If he
is developing a system for the training of new tasks or con-
tent, he can compare the new training with the training activ-
ities listed in Table 3 and thus determine the most probable
context classification. After he has determined the classifi-
cation of the context of the instruction he is developing, he
will consult Table 4 (after reading the descriptions of the
categories) to find: (1) the description of the context class
(that is, influences and conditions in terms of the eight con-
trolling factors); (2) implications for the selection of in-
structional models; and (3) implications for the design of
instruction. It is at this point that he will probably make
a decision about whether to individualize. If an individual-
ized system is required, his decision is made for him, but if
it is only desired, he could decide on a conventional, "lock-
step" form of instruction if he considers the context too
constraining for individualized instruction.

Supported by this information -- and if he decides to
individualize -- the developer would then select one or more
models of individualized instruction that he will consider as
he continues to develop his system. His selection could pro-
ceed in at least two ways: he could take the models directly
from the relevant cell of Table 5, or he could take the impli-
cations for model selection from Table 4 -- perhaps confirming
or revising them after a review of the factor-by-factor de-
scriptions of the relevant categories -- and use these to
select models.

Once he had selected models, he would begin ISD Block
III.1. Guided by the models and the description of the con-
text class, he would develop the learning activities. He
would then make the design decisions required by ISD Block
III.2, again checking each of his decisions or choices
against the models and context description. By considering
each candidate delivery system as it would apply to the
selected models within the given context class, for example,
he would avoid selecting an inappropriate or unworkable de-
livery system. By the time he had completed Block III.2, or
sooner, one of the models he had selected would emerge as the
best choice, and he would continue to develop it, discarding
the others. In some cases, however, because of the range of
conditions (parameters and constraints) within the context
class of the instruction he is developing, he may continue to
develop two or more models in order to provide alternatives
for the different conditions that instructors might encounter
at the time training is conducted. He could, for example,
provide a variable-treatment option for groups of students
of widely different abilities or backgrounds, and a fixed-
treatment option for essentially homogeneous groups.

o <u>ISD procedures subsequent to the individualization procedures.</u>
   After he had completed ISD Block III.2, the developer would
   not need to consult the individualization procedures again
   except to reconsider or confirm previous decisions. From
   Block III.3 on, he would carry out the remaining ISD proce-
   dures by reference to decisions and choices he had already
   made.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

This volume has presented a method for the classification, analysis, and description of the contexts, or whole environments, of Armor instruction. It has discussed the rationale for the method, demonstrated its uses, and established its explicit and implicit links with the generic models of individualized instruction proposed as guides to the development of instructional systems for the various contexts.

It has also presented sixteen generic models of individualized instruction, described the scheme of classification that organizes the models, discussed the implications of each of the dimensions of that classification scheme, described the probable impacts of each model, and offered guidance for the selection of models. But the models are not meant to stand alone. Rather, they are seen as a part of a general approach to instructional design that includes the identification of the context of instruction, a careful consideration of the factors that influence instruction within the context, and the ISD procedures.

The review of the literature of individualized instruction that informed the development of this general approach or procedure was fairly extensive, but the data descriptive of the contexts of Armor instruction that guided and restrained the development were neither extensive enough nor precise enough to answer the question of the general validity and reliability of the context descriptions. Should this procedure be seen as a potentially valuable tool for the development of individualized instruction, a much broader and more precise base of descriptive data would be needed.

The validity of the procedure itself is a question that appears to require an operational test. If the procedure appears to have at least face validity, a few developers who are or will be involved in the early stages of the development of systems of individualized instruction should attempt to use it. Even before these systems are fully designed or developed, any benefits derived from the procedure should become apparent, and implementation would reveal the extent to which the procedure had contributed to the development of systems well tailored to their environments.

It could be that the system of context classification and description will be useful not only as a basis for selecting appropriate models of instruction, but also for identifying opportunities for training. A quick glance at the classification matrix (see Table 3) reveals that most of the cells appear to be empty. Admittedly, the sample of instructional activities on which Table 3 is based was small, but it was probably large enough to show the relative frequency with which instruction occurs within at least theoretically possible contexts. Table 3 shows, for example, that just four (4) context classes (A-F-I, B-F-I, C-F-H, and C-F-I) account for 70% of the instructional activities in the sample. But if the training developer or manager were to look at the empty cells of the matrix and try to imagine what kind of training might exist within such contexts, he could discover opportunities for training that he would want to exploit. Suppose, for example, that a training manager or commander, concerned about the number of soldiers in his command who seem to be deficient in certain areas of knowledge, attempts this strategy and discovers

that one empty cell -- D-G-H -- pretty well describes the limits of the resources he can dedicate to the knowledge problem. The setting is independent and thus requires few or no instructors. (He has few or no qualified instructors to assign to this training.) The time is fixed. (He could schedule one or two hours a week for six weeks for soldiers not otherwise occupied.) The focus is knowledge, what he is concerned about. (Because the setting is independent, the appropriate models of instruction give him great flexibility.) Suppose he then decides to schedule two hours of independent study each week for six weeks for knowledge-deficient soldiers not otherwise occupied. He would have appropriate independent study materials placed in the learning center or dayroom. He would direct small-unit leaders to identify deficient areas of knowledge soldier by soldier. He would have appropriate tests developed and assign contingencies to various levels of test performance. Then, at the scheduled time each week, each available knowledge-deficient soldier would go to the learning center, the dayroom, or some other place of his choosing, to study his own content, guided by his own set of objectives (probably the test questions in alternate form). As he completed each objective (within his own set) he would go to an assigned place to take a brief but discriminating test and reap the consequences of his performance. The generic model that has been employed is Model 6, fixed treatment, variable proficiency, variable objectives, and fixed time. At the end of the six weeks not all soldiers would have studied all of their deficient areas nor would they all have scored as well on tests as might be wished, but most will have made significant progress -- largely at the expense of resources that might otherwise have gone unusued. The constraints within which units now operate suggest that there is a need to explore the possibilities of this strategy for discovering and exploiting opportunities for training.

There is also a need to examine the policy implications of the generic models of individualization instruction presented in this volume. Table 5 shows that Table 4, as it is now constituted, recommends relatively few generic models for most contexts; a broader application of models to contexts awaits changes in policy. Suppose, for example, that a change in policy were to make feasible the use of variable-objectives generic models in MOS courses at the institution. The variable-objectives provision could result in soldiers with limited ability and motivation getting through a limited set of objectives, unmistakably at criterion level, and into productive work in the units. Their supervisors would know that they had not learned all their MOS tasks but that they were likely to perform acceptably on those they had learned. And the tasks they had learned would most likely be those performed by new soldiers in any event.

Recommendations are as follows:

o Survey more training activities in order to refine Table 4.

o Conduct an operational test of the individualization procedures.

o Determine the utility of the system for context classification and description as a means for identifying training opportunities.

o Examine the policy implications of the generic models of individualized instruction.

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Appendix A

Detailed Results of Interviews,
Administration of Questionnaires,
and Informal Observations

Part 1

Data of the First Phase

(Fort Knox)

(See Table A.1.1)

NOTE

The data collected for the purpose of providing a preliminary test of the
validity of the context-classification-and-analysis system, and also for the
purpose of establishing guidelines for the subsequent development of the context
classification-model selection procedures, is presented here in as raw a form
as in consistent with clear communication.

As has been explained in Chapter I, data collection was carried out in two
phases: the first phase consisted of interviews (unstructured at first and then
structured) and informal observations at Fort Knox; the second phase, begun
after formal instruments had been developed as a result of the visit to Fort
Knox, consisted of structured interviews, the administration of questionnaires,
and informal observations in Armor units at Fort Carson and Fort Hood. The data
of the two phases are therefore in somewhat different form.

The data of the first phase are presented almost exactly as they were re-
corded during the interviews (both unstructured and structured) at Fort Knox and
are also summarized in Table A.1.1. The data of the second phase, collected
largely through formal instruments, are presented in a partially reduced, tabular
form. See Table A.2.1 and Table A.2.2.

The objectives of the study phase of the trip to Fort Knox are to assess the appropriateness of the proposed context classification system and to select (and perhaps rank in order of importance) factors on which the definition of contexts will be based. Non-survey methods will be employed, including informant interviews, unstructured interviews, structured interviews, and participant observations.

First, informant interviews will be conducted with ARI Field Unit personnel. Next, after a brief period of planning, unstructured interviews will be conducted with focused groups consisting of relevant training managers and instructors. These unstructured interviews will be followed by structured interviews with other focused groups of relevant training managers and instructors to explore in depth areas shown to be of interest by the unstructured interviews. Interviews will be followed by (or perhaps be concurrent with) participant observations of training in progress during which the evolving context classification system will be employed.

(Data-collection activities are given in order of their occurrence)

194th Bde -- 14 May

Unstructured interview with 4 respondents, including S-3, to determine validity of system for classification and definition of contexts of Armor training. See Unstructured Interview Procedure.

Interview began with explanation of research problem. Then "training environment" was defined through an illustration. Respondents agreed that, given a training environment (context) defined by setting, focus, and time constraints, a difference in setting, focus, or time constraints from one situation to another would indicate a different training environment.

They did not suggest adding or deleting any factors through which training environments (contexts) are to be defined but did suggest that, under instructional personnel, it is important to know that an instructor has been trained as an instructor and to know that an NCO is good at his MOS, i.e., what he teaches.

When the question of whether the factors (see list) had been arranged in descending order of importance (actually, only a very approximate order of importance was intended), one respondent suggested that the management capability factor was more important than the facilities factor.

This one unstructured group interview, along with the one-on-one validation of the unstructured interview conducted earlier (see Table 1), appeared to establish an adequate basis for the development of a structured interview, and all subsequent group interivews were structured. See Structured Interview Procedure.

Maintenance Department, USAARMS -- 15 May

Structured interview with 6 respondents including NCOIC of program.

Responses to interview questions:

<u>#1.</u> Yes; no dissents

<u>#2.</u> Yes; no dissents

<u>#3.</u> No; no dissents

<u>#4</u> Yes; no dissents

<u>#5.</u> (Parameters of factors)

     (1) The length of instructional periods matters. Length of breaks in courses also important; "Christmas is a wipe-out."

     (2) Ability as instructor more important than MOS ability. Respondents believe that it is not necessary in self-paced instruction for an instructor to be extremely knowledgeable. An instructor's supervisors and colleagues are aware of his effectiveness as an instructor and would be capable of judging him fairly. Versatility is also important to a self-paced instructor because he must be able to occasionally fill in for another instructor. Leadership ability, as indicated by ranks, is also thought to be important.

     (3) Under facilities, lighting, ventilation, and available space are thought to be important.

     (4) Management capability is important to definition of a training environment (context).

     (5) Under task type both type and difficulty were thought to be important considerations.

     (6) Under learner characteristics the following parameters were considered important:

- reading ability
- motor ability
- language ability (e.g., speaks English if native
  speaker of Spanish)
- achievement (prior military or civil)

     (7) Knowledge of feasible instructional methods important to definition of a training environment.

     (8) Knowledge of available instructional resources important to definition of a training environment.

A-3

Structured interview with 6 instructors including SGM in charge.

Responses to interview questions:

#1. Yes; no dissents

"2. Yes; no dissents

#3. No; no dissents

#4. Yes; no dissents

#5. (Parameters of factors)

(1) It is important to know what possibilities exist to self-pace within fixed time. BNCOC instructors are able to vary time for small segments of instruction in response to individual learning rates. That is, when all learners in a group have completed a learning activity, the group moves on to the next activity whether in less than or more than the nominal time. The time for all activities must, of course, fit into the overall fixed time for the course, but there is, apparently, ample overall time.

(2) It is important to know something about the instructors' ability to function in individualized instruction.

(3) Important to know something about available space.

(4) Important to know something about management capability, e.g., ability to administer, score, and feedback results of a large number of tests in a short period of time.

(5) Respondents felt that it would be important to know whether tasks being learned are predominantly perceptual-motor or predominantly cognitive, for example, but their judgment was that Armor training leaned about 75-85% toward perceptual-motor.

(6) Under learner characteristics the following parameters were considered important:

- achievement
- motivation (e.g., reenlistment plans)
- how long in MOS
- how long in service
- jobs in MOS

(There was not much interest in aptitude.) (This course uses an instrument to assess learner characteristics, including the above.)

(7) Knowledge of feasible instructional methods is important. Some may not be compatible with military requirements. Discovery learning, for example, may not be compatible with military resource management requirements.

(8) It is important to know how good or how operational resources are, whether they are what is needed, and whether they are appropriate for the skill level involved.

———————
———————

Exercise of the classification system conducted with two respondents from above group.

- Context of Fire Commands (4 hours, nominal)

  - instructional, indoor
  - focus on technique
  - variable time (i.e., unit or module time
    is variable within limits of overall
    course time.)

- Context of Map Reading (6 hours, nominal)

  - instructional, indoor moving to
    instructional, outdoor (thus 2 cells
    of matrix are required to inclose
    this context.)
  - focus on technique
  - variable time

- Context of Tank Firing Exercise (1 day and 1 night, nominal)

  - operational setting
  - focus on technique
  - variable time

- Context of Range Estimation (3 hours, nominal)

  - instructional, indoor (classroom)
    moving to operational setting (thus
    2 cells of matrix required to inclose
    context)
  - focus on technique
  - variable time

- Context of Troop Management (2 hours, nominal)

  - instructional, indoor (classroom)
  - focus on technique
  - variable time

(In BNCOC, the respondents said, time is a guideline.)

A-5

1st Bde OSUT/AIT -- 16 May

Structured interview with 2 instructors and 1 training manager to classify and define two contexts of Armor training. Thus, purpose of interview was primarily to exercise system rather than to assess its validity.

Each instructor provided the data for the classification and definition of one context.

1. Context of Individual Weapons Training -- 45 cal. pistol

- instructional indoor moving to
  instructional outdoor
- focus on equipment followed by
  focus on technique
- fixed time (some flexibility in
  contraction of time but none in
  expansion)

(Thus, 2 cells of matrix are required to inclose context.)

Factors

- Instructional personnel

  o instructor/student ratio
     o indoor 1/15
     o outdoor 1/15
     o at range 1/3

- Facilities

  o indoor dividable room
  o outdoor training area with
     electrical power but no
     covered space

- Management capability

  o reported that management
     capability probably meets
     individualized instruction
     requirements but that 500-
     600 instructional decisions/
     day would be too much (based
     on 50-60 students taking an
     average of 10 pretests and
     posttests each 8 hour day.
     Small steps asssumed.)

- Task types

  o predominantly perceptual-motor

A-6

- Learner characteristics

    o *no prior service experience*
    o 8th grade reading ability (students
       generally can read but reading is
       last choice for instructional
       delivery)
    o most have finished high school
       but without acquiring skills
       generally assoicated with high
       school students of the past.
    o motivation generally high at
       beginning of cycle but may decline
       later (testing may have impact).
       (Primary equipment is motivational.)

- Feasible methods

    o problem-solving not feasible
    o small-steps not feasible
    o contingency management feasible
    o impromtu scheduling of learning
       not feasible

- Available instructional resources

    o reported that personnel and equip-
       ment are tightly controlled by
       TRADOC.

2. Context of Indirect Fire (IF-1 and IF-2)

    - independent and instructional indoor
    - focus on technique
    - variable time (to some extent)

(Thus, 2 cells of matrix are required to inclose context.)

Factors

- Time available

    o 3 hour block and 4 hour block
       (review and independent study are
       separate) (3 hour/IF-1 and 4 hour/
       IF-2)

- Instructional personnel

    o instructor/student ratio
    o in IF-1 1/60-80
    o in IF-2 1/20-25

- Facilities

  o fixed -- a classroom

- Management capability

  o no additional management
    capability

- Task types

  o cognitive

- Learner characteristics

  o 3-4th grade reading ability
    (manuals are at about 6th grade
    level but students can't read them)
  o most have finished high school but
    do not have skill usually associated
    with high school students of past
  o typical soldier wants to learn but
    doesn't have ability
  o motivation appears to remain constant
    during training

- Feasible methods

  o small-step, immediate feedback/
    reinforcement method feasible
  o contingency management may not be
    feasible (not enough control of
    contingencies)
  o problem solving approach not
    feasible

- Instructional resources

  o adequate
  o additional resources are
    available
  o additional simulators may be
    available

Weapons Department, USAARMS -- 17 May

Structured interview with 2 instructors to classify and define
one context of Armor training. Purpose of interview was to exercise
classification system rather than to assess its validity.

Context of Target Acquisition and Identification

- instructional, indoors moving to
  instructional, outdoors
- focus on technique
- fixed time

(Two cells of matrix required to inclose context.)

Factors

1. Time available

   o solid block of instructional time

      o 16 hours
      o 4 + 4 1st day
      o 4 + 4 2nd day

2 Instructional personnel

   o 5 instructors for instructor/student
      ratio of 1/3
   o instructors trained by peers
   o master gunnery instructors must be
      master gunners; otherwise, no criteria
      for selection of instructors. All
      instructors know subject.

3 Facilities -- a little cramped on space

4. Management capability -- capability for management
   of individualized instruction exists.

5. Task type -- mental abilities predominant

6. Learner characteristics -- (NCOs)

   - 12th grade or higher reading level
   - highly motivated (recommended by commander)
   - above average in mental ability

7. Feasible instructional methods

   - contingency management not feasible
   - nurturing system not feasible
   - ordering from easy to difficult
     feasible and used
   - problem solving not feasible

8. Available instructional resources -- additional
   instructional resources are generally available.

Informal interview with several instructors of Tank Turret Mechanic Course, which is individualized (self-paced). Because of queuing problems, this course has gone to the same double-shift arrangement as Tracked Vehicle Mechanic Course: 6 am-3 pm and 3 pm to midnight. Chairman of department said that instructors like this arrangement, but his observation is questionable. Many revisions are underway; one instructor claimed that they are in their fourth rewrite, and course began in January 1979.

Classification

setting -- instructional indoor
focus -- equipment
time -- variable (6 weeks is average and range is about 4
weeks -- 8 weeks; after 3 weeks + 3 days man should be evaluated for retention.)

1. Time available -- nominally, 8 weeks + 3 days. Only 1 man out of 200 has gone over 8 weeks. (Early graduates go to next station and are not assigned to fatigue duties.)

2. Instructional personnel -- instructors are trained first in "lock-step" methods and then as self-paced instructor. Trained on the job by peers in self-paced methods. The claim is that self-paced instructors do learn to reinforce trainees. "They don't let a man goof off or hurt himself, but they don't interfere with learning."

3. Facilites -- large lecture room with individual carrels plus lab with trainers (about 20 modified tank turrets on special mounts).

4. Management capability -- Queues of 7-8 trainees occasionally develop, but there are no additional personnel to handle queues. This claim in spite of fairly heavy organization chart (see management guide) and 6-8 instructional personnel in evidence.

5. Task types -- motor -- 11 of 13 exams are hands-on.

6. Learner characteristics --

- reading grade level is 4-6
- some trainees are beyond the resources
  of the system, but it is very difficult
  to remove them from the course.

CONTEXT OF (Subject/tasks)	DEFINING FACTORS				
	Time Available	Instructional Personnel	Facilities	Management Capability	Task Type
C-F-I (Fire Commands -BNCOC)	Normally 4 hours but. total time and period length can be varied to meet need of individuals.	NCO who are judged to be good role models. Student-instructor ratio probably about 3 to 5.	Adequate classroom space, but building is small and instructional space probably not expandable.	Already managing some aspects of individualized instruction. A great deal of testing.	Cognitive
C-F-I (Troop Management -BNCOC)	Nominally 2 hours but total time and period length can be varied to meet needs of individuals.	NCO who are judged to be good role models. Student-instructor ratio probably about 3 to 5.	Adequate classroom space, but building is small and instructional space probably not expandable.	Already managing some aspects of individualized instruction. A great deal of testing.	Cognitive
A-F-I (Task Firing Exercise -BNCOC)	Nominally 1 day and 1 night but flexible.	NCO who are judged to be good role models. Student-instructor ratio probably about 3 to 5.	Training areas of USAARMS.	Already managing some aspects of individualized instruction.	Cognitive and perceptual-mo Perhaps 75% p ceptual-motor and 25% cogni
D-F-I/A-F-I Estimation - BNCOC	Nominally 3 hours but varied to meet needs of individual trainees in groups.	NCO who are judged to be good role models. Student-instructor ratio probably about 3 to 5.	Training areas of USAARMS.	Already managing some aspects of individualized instruction.	Cognitive
C-E-I Tank Turret Mech. Course - (AIR) Weapons Department USAARMS	After 8 weeks and 3 days trainnee is evaluated for retention. Only 1 of 200 has gone over 8 weeks.	Trained in "lockstep" instruction first and then trained on job in "self-paced" instruction. Student-instructor ratios of about 4 but sometimes up to 8.	Large room with individual carrels and lab with 20 turret trainers.	Queues of 7-8 occasionally develop, but no additional personnel to handle queues.	Motor-percept (11 of 13 tes are hands-on)
C-F-I/B-F-I (Map Reading -BNCOC)	6 hours, nominal, but can be varied to meet needs of individual trainees within groups.	NCO who are judged to be good role models. Ratios probably about 3 to 5.	Adequate classroom space in small building and outdoor training areas of USAARMS.	Already managing some elements of II, a great deal of testing	Cognitive
C-F-H/B-F-H (Target Acquisition and Identification Weapons Department USAARMS)	16 hour block 4+4 1st Day, 4+4 2nd day.	5 instructors for student-instructor ratio of 3. Master gunnery instructor must be master gunner; otherwise, no selection criteria.	Indoors a little cramped for space.	II management capability reportedly exists.	Cognitive predominant
C-F-H/B-F-H (Individual Weapons Training -OSUT)	(No Data)	Student-instructor ratios - 5 indoor, outdoor ? at range.	Indoor, classroom. Outdoor training area with electric power.	Probably meets II requirements, but 500-600 instructor decisions/day would be too much.	Predominantly perceputal-motor.
D-F-H/C-F-H (Indirect Fire - OSUT (IF-1 and IF-2)	3 hour block and 4 hour block (Review and independent study are separate)	Student-instructor ratios: IF-1 = 60-80 IF-2 = 20-25	Classroom	No additional management capability.	Cognitive

Table A.1.1

Descriptions of Contexts

Source of Data: Fort Knox   (Institution)

DEFINING FACTORS					
Facilities	Management Capability	Task Type	Learner Characteristics	Instructional Methods	Instructional Resources
Adequate classroom space, but building is small and instructional space probably not expandable.	Already managing some aspects of individualized instruction. A great deal of testing.	Cognitive	Well motivated junior NCO.	Self-pacing already present to an extent, is apparently feasible.	Necessary sources generally available.
Adequate classroom space, but building is small and instructional space probably not expandable.	Already managing some aspects of individualized instruction. A great deal of testing.	Cognitive	Well motivated junior NCO.	Self-pacing already present to an extent, is apparently feasible.	Necessary sources generally available.
Training areas of USAARMS.	Already managing some aspects of individualized instruction.	Cognitive and perceptual-motor. Perhaps 75% perceptual-motor and 25% cognitive	Well motivated junior NCO.	Self-pacing already present to an extent, is apparently feasible.	Necessary sources generally available.
Training areas of USAARMS.	Already managing some aspects of individualized instruction.	Cognitive	Well motivated junior NCO.	Self-pacing already present to an extent, is apparently feasible.	Necessary sources generally available.
Large room with individual carrels and lab with 20 turret trainers.	Queues of 7-8 occasionally develop, but no additional personnel to handle queues.	Motor-perceptual (11 of 13 tests are hands-on)	Reading grade level 4-6. Some beyond resources of system.	Self-pacing, contingency management, little selection.	No apparent constraints.
Adequate classroom space in small building and outdoor training areas of USAARMS.	Already managing some elements of II, a great deal of testing	Cognitive	Well motivated junior NCO.	Self-pacing already present to an extent and is apparently feasible.	Necessary resources are generally available.
Indoors a little cramped for space.	II management capability reportedly exists.	Cognitive predominant	12th grade reading level or higher. Highly motivated.	Ordering from easy to difficult.	Additional resources generally available.
Indoor, classroom. Outdoor training area with electric power.	Probably meets II requirements, but 500-600 instructor decisions/day would be too much.	Predominantly perceputal-motor.	8th grade reading level	Contingency management, self-pacing.	Available but tightly controlled.
Classroom	No additional management capability.	Cognitive	3-4 th. grade reading level, trainees can't read manuals (at 6 grade level).	Small-steps, immediate feedback.	Adequate. Additional simulators may be available.

A-11

Part 2

Data of the Second Phase

(Fort Carson and Fort Hood)

(See Tables A.2.1 and A.2.2

STUDY PLAN

Fort Carson and Fort Hood

Structured interviews will be conducted with Bn S-3s and certain instructors. During the interviews as many contexts as possible will be classified (using the matrix), and instructors with intimate knowledge of those contexts will be identified. After the interview these latter will be administered questionnaires.

During the p.m., training activities dealt with in the interviews and questionnaires will be observed in the company of one or two persons who participated in the interviews. Data collected through the interviews and questionnaires will be tested and, presumably, insights will be gained.

During the interviews, anecdotal data on contexts will be recorded, and this process will continue during the observations of training activities.

Descriptions of Contexts

Source of Data: Fort Carson   (Units)

CONTEXT OF (subject/tasks)	DEFINING FACTORS					
	Time Available	Instructional Personnel	Facilities	Management Capability	Task Type	Learners Characteristics
A-F-I (Redeye-tactics)	6 hours per day scheduled in 50 min periods. Self-pacing possible. Solid block.	Instructors experienced in subject and individual instruction. Frequently substitute for each other.	Adequate only. Classroom (large and small). Outdoor training areas, tactical areas.	Tests given every 2-3 instructional periods. Returned in 2-3 days. Used for learner assessment. Trainees are counseled.	Perceptual-motor. Average difficulty. Serious consequences to mission.	Low mil. achievement Average motivation. Low reading, high motor ability. Average language ability.
D-F-I/A-F-I (Tactical Operations Center Training)	Week at a time, every other month. Self-pacing probably not possible because of coordination requirements.	Ratios about 3. Instructors have some experience with tasks and both II and "lockstep" instruction.	Adequate classroom, indoor areas, outdoor/tactical areas.	Little testing, instructors flexible. Trainees are counseled.	Peceptual-motor and cognitive. Difficult, very important, frequent serious in failure.	High in achievement and motivation. High in reading and language, average in motor ability.
D-C-I (Basic Skills Remedial Training Reading, etc.)	About 3 hours at a time when personnel are available.	Inexperienced. Usually some experience in "lockstep" but none in Individualized Instruction. Substitue for each other. Student-instructor ratio about 15.	Inadequate (this apparently refers to Learning Center).	Frequent testing, immediate scoring, tests used for diagnoses of both trainee and instruction.	Cognitive. Easy and of average importance. Daily requirements for task, failure can be serious.	Low achievement and motivation. Low language ability.
B-F-I (CBR) (Same as NBC)	10 hours over a period of time. 180 min. periods of instruction. Self-pacing could be	Student-instructor ratios: - for specialized team 5-10 - for company 20-50 Instructors experienced in "lockstep," seldom substitute for each other.	More than adequate outdoor areas. No constraints.	Tests given only at end of training or never. Trainees not counseled.	Perceptual-motor and cognitive. Failure to perform may be serious.	Average achievement and low motivation.
B-F-I (Gunnery - hands-on component)	6 hour block self-pacing possible.	Instructor has some training/experience in both II and "lockstep". Student-instructor ratio about 30.	Inadequate outdoor and tactical training areas.	Frequent testing and diagnostic use of tests but slow scoring and return. Trainees not counseled.	Perceptual-motor. Average difficulty. Importance to mission. Failure apparently not serious (?)	Average in motivation and achievement. Reading ability, motor ability, language ability average.
B-F-I (Physical Training)	2½ hours/weeks, 30 minute blocks - every work day. Not self-pacable. No breaks.	2-3 years experience with same experience in individual instruction and "lockstep". Frequent substitution. Student-instructor ratio about 20.	4 outdoor training areas shared.	Test at the end of training or never. Feedback during the period of instruction. GO/NO GO. Instructors assist anytime. Counseling when needed.	Perceptual-motor. Easy tasks questionable importance Annually. Failure not serious.	Prior military and civilian achievement-average. Motivation-high. In MOS 4 months In service 6 months Reading ability-ave. Motor ability-high. Language ability-ave.
B-F-II (Gunnery-Subcalibre: Table 1, Table 2, and Table 3)	Apparently scheduled a day at a time.	TCs and Platoon Sergeants. Ratio, thus, is about 2.	Range - appears adequate	Only that existing in normal command structure.	Motor-perceptual some cognitive	May have been poorly trained in institution
C-F-II/B-F-II (Map Reading)	Apparently scheduled about an hour at a time when priorities permit. Often cancelled because of other needs.	One instructor for whatever number of trainees can be assembled. Instructors are "lockstep" type but flexible.	One or 2 classrooms and practically unlimited outdoor space.	No formal tests. Only informal performance tests.	Cognitive predominant but some perceptual-motor. Average difficulty and importance.	Average to Low in achievement and motivation.
C-F-II (Gunnery-Basic skills)	Constraints on unit training time impacts heavily on this training. 24 hours available in 50 minute periods Scheduled 2 or 3 times per week. Self-pacing would be provided in available time.	Have some experience in both "lockstep" and self-pace. Flexible in instructor assignments. Student-instructor ratio is about 60.	Inadequate space. Facility shared with other training activities.	Limited. Tests given only at end of units. Results delayed 2-3 days. Flexible in instructor assignments. Trainees counseled when necessary.	Cognitive: Average difficulty but very important and failure serious.	Average achievement, low motivation. New personnel of high motor ability, average reading and language skills.
C-C-II (Race Relations) (No data. Following are estimates.)	1 or 2 hours scheduled as required by regulation or other directive	1 NCO per classroom of 30-40 or more.	Classroom	Only that associated with platform instruction.	Cognitive, affective	Low achievement, Low motivation

Table A.2.1

Descriptions of Contexts

Source of Data: Fort Carson   (Units)

	Facilities	Management Capability	Task Type	Learners Characteristics	Instructional Methods	Instructional Resources
DEFINING FACTORS						
...nal ...? ...l in sub-...dividual ...substi-...ch	Adequate only. Classroom (large and small). Outdoor training areas, tactical areas.	Tests given every 2-3 instructional periods. Returned in 2-3 days. Used for learner assessment. Trainees are counseled.	Perceptual-motor. Average difficulty. Serious consequences to mission.	Low mil. achievement. Average motivation. Low reading, high motor ability. Average language ability.	Contingency management. Adaptive training. Variable curriculum completely feasible.	Resources available and operational but no additional resources available.
...t 3. ...have ...ence with ...oth II ...ep"	Adequate classroom, indoor areas, out-door/tactical areas.	Little testing, instructors flexible. Trainees are counseled.	Perceptual-motor and cognitive. Difficult, very important, frequent serious in failure.	High in achievement and motivation. High in reading and language, average in motor ability.	Contingency management. Adaptive training and variable curriculum of limited feasibility.	Resources available and reasonably operational.
...ed. Usually ...ence in ...but none ...nalized ...n. Sub-...each other. ...tructor ...t 15.	Inadequate (this apparently refers to Learning Center).	Frequent testing, immediate scoring, tests used for diagnoses of both trainee and instruction.	Cognitive. Easy and of average importance. Daily requirements for task, failure can be serious.	Low achievement and motivation. Low language ability.	Most methods feasible.	Resources lacking but are available. Devices not adequately operational.
...tructor ...alized ...ny 20-50 ...experi-...lockstep," ...stitute ...ther.	More than adequate outdoor areas. No constraints.	Tests given only at end of training or never. Trainees not counseled.	Perceptual-motor and cognitive. Failure to perform may be serious.	Average achievement and low motivation.	Small steps considered feasible.	Device/simulation/equipment not adequately operational.
...has some ...xperience ...and ...Student-...ratio	Inadequate outdoor and tactical train-ing areas.	Frequent testing and diagnostic use of tests but slow scoring and return. Trainees not counseled.	Perceptual-motor. Average difficulty. Importance to mission. Failure apparently not serious (?)	Average in motivation and achievement. Reading ability, motor ability, language ability average.	Contingency management and adaptive training completely feasible.	Resources available and operational.
...experience ...experience ...al instruc-..."lockstep". ...stitution. ...tructor ...t 20.	4 outdoor training areas shared.	Test at the end of training or never. Feedback during the period of instruction. GO/NO GO. Instructors assist anytime. Counseling when needed.	Perceptual-motor. Easy tasks questionable importance. Annually. Failure not serious.	Prior military and civilian achievement-average. Motivation-high. In MOS 4 months In service 6 months Reading ability-ave. Motor ability-high. Language ability-ave.	Contingency management, Small steps, Adaptive training.	Resources are not available.
...atoon ...Ratio, thus, ...2.	Range - appears adequate	Only that existing in normal command structure.	Motor-perceptual some cognitive	May have been poorly trained in institution.	Self-pacing probably not feasible.	M55 laser is a problem. Brewster device also. Not always maintained.
...ctor for ...number of ...can be ...re are ...type but	One or 2 classrooms and practically unlimited outdoor space.	No formal tests. Only informal per-formance tests.	Cognitive predom-inant but some perceptual-motor. Average difficulty and importance.	Average to Low in achievement and motivation.	Small steps/adaptive training feasible for basic skills. Contingency manage-ment of limited feasibility.	Needed resources exist and are avail-able and work. No apparent constraints.
...experience ..."lockstep" ...pace. ...assign-...udent-...ratio ...0.	Inadequate space. Facility shared with other train-ing activities.	Limited. Tests given only at end of units. Results delayed 2-3 days. Flexible in instructor assignments. Trainees counseled when necessary.	Cognitive: Average difficulty but very important and failure serious.	Average achievement, low motivation. New personnel of high motor ability, aver-age reading and lan-guage skills.	Small steps feasible. All others of limited feasibility. Unit constraints impact on instructional methods.	Adequate.
...classroom ...r more.	Classroom	Only that associated with platform instruction.	Cognitive, affective	Low achievement, Low motivation	Group interaction. Self-pacing probably not feasible.	Except for materials. Probably limited.

Source of Data: Fort Hood   (Units)

CONTEXT OF (Subject/tasks)	DEFINING FACTORS			DEFINING FACTORS		
	Time Available	Instructional Personnel	Facilities	Management Capability	Task Type	Learner Characteristics
C-F-I (Tactics/ Tank Platoon)	One day.	One NCO and one Officer. Student-instructor ratio about 3 to 5.	Classroom with large terrain model.	One instructor (NCO) involved in conducting game. Other could be "score keeper".	Cognitive (problem solving, analysis)	Young officers (1st LT, 2nd LT)
C-F-I (NCO train-ing/leader-ship)	5 hours 60 minute periods block. Weekly by Co and monthly by Bn. Self-pacing possible. No breaks.	10 years experience with some in indi-vidualized instruc-tion and lots in "lockstep". Frequent substitution of instructors. Student-instructor ratio about 20.	Inadequate: 1 small classroom and in-dependent study area. Maximum outdoor and tactical training areas. All are shared.	Testing after train-ing if at all. Results after 3 days. Tests only for achieve-ment. Instructors assist any time. Counseling when needed.	Cognitive average difficulty. Very important. Taught daily. Serious consequences for inadequate per-formance.	Prior military achievement-high. Prior civilian achievement-average. Motivation high. 5-15 years in MOS, service.
D-F-I/A-F-J (Gunnery/ Range Firing)	12 - 24 hours in 1 block. Not self-pacable. No breaks.	1 - 2 years without experience in individ-ualized instruction; some with "lockstep". Frequent substitution of instructors. Student-instructor ratio about 3.	Inadequate: 1 small classroom, 1 large classroom and lab. 1 independent and outdoor areas. 4 tactical areas. 5 other ranges. All areas are shared.	Testing at the end of training units and feed-back during the same period. GO/NO GO. Instructors assist any time. Counseling when needed.	Perceptual-motor. Average difficulty. Very important. Done Annually. Serious consequences for inadequate per-formance.	Prior military achievement-aver-age. Prior civilian achieve-ment and motivation low. In MOS 12 months. Inservice 18 months. Reading ability-low. Motor and language ability-average.
B-G-I (Maintenance/ Tank)	8 hours, variable class period self-pacing possible. No breaks occur in instruction.	24 years experience some individualized and "lockstep" experience. Seldom substitute instructors. Student-instructor ratio 3. Instructors are TCs and other NCOs.	Adequate: one large class, lab, in-dependent study area, outdoor area and tactical area. Classrooms and tactical areas are shared. Facility is motor pool.	Testing and feedback each period for dia-gnostic purposes. Regular counseling. Instructors assist any time. Very limited. 1 NCO may supervise main-tenance of up to 6 tanks.	Perceptual-motor very easy tasks. Very important tasks. Done daily; very serious consequences.	Prior achievement low; motivation ave-erage. 6 months in MOS and inservice. Low ability. No previous jobs.
B-E-I (Maintenance/ Individual Weapons)	4 hours in a block additional as nec-essary. Self-pacing possible. No breaks in instruction.	3 years experience. Some experience in individualized instruction and "lockstep". Instructors sub-stitute occasionally. Student-instructor ratio 3.	More than adequate 2 outdoor and 3 tactical areas. Shared.	Tests at end of course; results after 3 days for diagnostic purpose. Instructors assist any time. Counseling by need only.	Motor tasks. Aver-age difficulty. Very important. Done Weekly. Very serious consequences for inadequate per-formance.	Average achievement and motivation. In MOS 6-8 months. In service 1 year. Average ability.
A-F-I (Tactics/Use of Terrain by Drivers)	24 hours weekly not self-pacable. No major breaks.	2-4 years with some individualized instruction and "lockstep". Experi-ence and substitution. Student-instructor ratio about 5.	2 small classrooms 1 independent study area, 1 outdoor area, 2 tactical areas. Classroom are shared.	Testing and feedback after training to assess achievement. Assist any time. Counseling when needed.	Motor tasks. Difficult tasks. Very important. Done weekly. Very serious consequences for inadequate per-formance.	Prior military achievement-average Prior civilian achievement and mo-vation-high. In MOS 8 months. Inservice 8 months. Average abilities.
C-F-I/B-F-I (Tank gunnery assessment)	2160 hours in 50 minute periods 2-3 times/week. Self-pacing possible. Holiday breaks.	1-2 years experience lots with individual-ized instruction some "lockstep". Frequent substi-tution of instructors. Student-instructor ratio about 4.	Inadequate. One small classroom, many outdoor and independent study areas available. Most areas are shared.	Testing and feedback each period. Results for diagnostic pur-poses, but counseling is not customary. Instructors assist one another freely.	Motor tasks, average difficulty. Very important. Done daily. Very serious consequences for inadequate per-formance.	Prior achievements average. Motivation low. Time in MOS/ service 6-12 months low ability.
C-F-N (Weapons Qualifica-tion/Famil-iarization)	8 hours in 50 minute periods. Unclear whether 1 day or 8.	3-5 years experience lots of individual-ized instruction and "lockstep" and sub-stitution of instructors. Student-instructor ratio about 30.	Inadequate 2-3 per small class, in-dependent study area, outdoor and tactical areas. All areas are shared.	Test and feedback every period for diagnostic purposes. Instructors assist any time. Counseling regularly.	Perceptual-motor. Average difficulty. Important tasks. Taught weekly. Very serious consequences.	High military achieve-ment. Low civilian achievement. Time in MOS 5 months. Time inservice 6-14 months. Average ability.
C-F-N (NBC) (Same as CBR)	30 hours/year in 60 minute periods presented weekly. No self-pacing. No breaks in instruction.	2 years experience lots of individual-ized and some "lock-step". Frequent substitution of instructors. Student-instructor ratio about 15.	Adequate-large class-rooms, outdoor and tactical areas avail-able and shared.	Test and feedback each period for diagnostic purposes. Assistance any time. Counseling for problems only.	Perceptual-motor. Easy tasks. Very important. Taught monthly. Very serious consequences.	Low prior achievement and average motivation. Time in MOS 12 months Time in service 2 years. High ability 1-2 prior jobs.
C-F-N (Gunnery/ Basic Knowledge)	Variable hours 2-3 times/week. self-pacing possible. TDY, short and long holiday breaks in instruction.	Experience 1-2 years. Some individualized instruction some "lockstep". Seldom substitute. Student-instructor ratio about 15.	Inadequate space; areas available: 1 small classroom, 1 lab; 1 independent; adequate outdoor and tactical training areas. All areas are shared.	Terminal test results 7 days. Criterion tests assistance by order or request, no counseling.	Perceptual-motor average difficulty. Very important. Done annually. Very serious consequences for inadequate per-formance.	All prior achieve-ment and motivation ratio low. Time in MOS 3 months-1 year Time in service 3 months-3 years read-ing and motor abil-ability-low.

Source of Data: Fort Hood   (units)

FACTORS	DEFINING FACTORS				
Facilities	Management Capability	Task Type	Learner Characteristics	Instructional Methods	Instructional Resources
...room with large ...in model.	One instructor (NCO) involved in conducting game. Other could be "score keeper".	Cognitive (problem solving, analysis)	Young officers (1st LT, 2nd LT)	Gaming simulation.	Tactical game
...quate: 1 small ...room and in- ...dent study area. ...um outdoor and ...cal training ...s. All are shared	Testing after training if at all. Results after 3 days. Tests only for achieve- ment. Instructors assist any time. Counseling when needed	Cognitive average difficulty. Very important. Taught daily. Serious consequences for inadequate per- formance.	Prior military achievement-high. Prior civilian achievement- average. Motivation- high. 5-15 years in MOS, service.	Contingency manage- ment, small steps, variable curriculum, learning of principles.	Needed resources are available. Additional resources not available.
...equate: 1 small ...sroom, 1 large ...sroom and lab ...dependent and ...loor areas. 4 ...tical areas. 5 ...r ranges. All ...as are shared.	Testing at the end of training units and feed- back during the same period. GO NO GO Instructors assist any time. Counseling when needed	Perceptual-motor. Average difficulty. Very important. Done Annually. Serious consequences for inadequate per- formance.	Prior military achievement-aver- age. Prior civilian achieve- ment and motivation low. In MOS 12 months. Inservice 18 months. Reading ability-low. Motor and language ability-average.	Contingency manage- ment, small steps, adaptive training.	Resources available and operational.
...quate: one large ...ms, lab, in- ...endent study ...s, outdoor area ...tactical area. ...asrooms and ...tical areas are ...ired. ...ility is motor ...al.	Testing and feedback each period for diag- nostic purposes. Regular counseling. Instructors assist any time. Very limited. 1 NCO may supervise main- tenance of up to 6 tanks.	Perceptual-motor very easy tasks. Very important tasks. Done daily; very serious consequences.	Prior achievement low; motivation av- erage. 6 months in MOS and inservice. Low ability. No previous jobs.	Limited contingency management, adaptive training, and variable curriculum. Small steps feasible.	Resources available and operational. Something other than TMs may be needed.
...e than adequate ...utdoor and 3 ...tical areas. ...red.	Tests at end of course; results after 3 days for diagnostic purpose. Instructors assist any time. Counseling by need only.	Motor tasks. Aver- age difficulty. Very important. Done Weekly. Very serious consequences for inadequate per- formance.	Average achievement and motivation. In MOS 6-8 months. In service 1 year. Average ability.	Contingency manage- ment, small steps.	Resources available and operational.
...mall classroom ...ndependent study ...a, 1 outdoor ...a, 2 tactical ...as. Classrooms ...shared.	Testing and feedback after training to assess achievement. Assist any time. Counseling when needed.	Motor tasks. Difficult tasks. Very important. Done weekly. Very serious consequences for inadequate per- formance.	Prior military achievement-average. Prior civilian achievement and moti- vation-high. In MOS 8 months. Inservice 8 months. Average abilities.	Small steps and variable curriculum.	Resources available and operational.
...adequate. One ...all classroom, ...ny outdoor and ...dependent study ...reas available. ...st areas are ...ared.	Testing and feedback each period. Results for diagnostic pur- poses, but counseling is not customary. Instructors assist one another freely.	Motor tasks, average difficulty. Very important. Done daily. Very serious consequences for inadequate per- formance.	Prior achievement: average. Motivation: low. Time in MOS/ service 6-12 months. low ability.	All options except variable curriculum, time and standards are feasible	Resources not avail- able or operational.
...adequate 2-3 per ...all class, in- ...pendent study ...es, outdoor and ...ctical areas. All ...as are shared.	Test and feedback every period for diagnostic purposes. Instructors assist any time. Counseling regularly.	Perceptual-motor. Average difficulty. Important tasks. Taught weekly. Very serious consequences.	High military achieve- ment. Low civilian achievement. Time in MOS 5 months. Time inservice 6-14 months. Average ability.	Contingency manage- ment and variable curriculum feasible. Limited small steps, adaptive training, and principles of learning.	Available and operational.
...quate large class- ...ms, outdoor and ...ctical areas avail- ...le and shared.	Test and feedback each period for diagnostic purposes. Assistance any time. Counseling for problems only.	Perceptual-motor Easy tasks. Very important. Taught monthly. Very serious consequences.	Low prior achievement and average motivation. Time in MOS 12 months Time in service 2-3 years. High ability 1-2 prior jobs.	Limited contingency management, small steps, variable curriculum, and principles learn- ing. Adaptive training feasible.	Available and operational.
...adequate space; ...ace available: 1 ...all classroom, 1 ...b; 1 independent; ...equate outdoor and ...ctical training ...as. All areas ...shared.	Terminal test results 7 days. Criterion tests assistance by order or request, no counseling.	Perceptual-motor average difficulty. Very important. Done annually. Very serious consequences for inadequate per- formance.	All prior achieve- ment and motivation ratio low. Time in MOS 3 months-1 year. Time in service 3 months-3 years read- ing and motor ability ability-low.	Limited contingency management and principles of learning.	Some resources available. Devices and equipment may not be operational.

APPENDIX B

Parameters and Constraints of Contexts

Part 1

The following tables, B.1.1 and B.1.2, are the result of the reduction
of the data presented in Appendix A, Part 1. These tables -- one for variable-
time contexts and one for fixed-time contexts -- identify some of the parameters
and constraints of the contexts of instruction as they are constituted at the
institution (Fort Knox).

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PARAMETERS and CONSTRAINTS

of ___variable___

(1) TIME CONTEXTS

Tabl. B.1.1

at the Institution (Fort Knox)

Arising from (actr's)	FOCUS	SETTING			
		Operational (A)	Instr., Outdoor (B)	Instr., Indoor (C)	Independent (D)
STU. AVAILABLE	Equipment (E)			Tight works plus for mechanic's course.	Not known but some apparently required for subjects continued in other settings.
	Technique (F)	3-24 hours but flexible.	One-half day may be typical for a subject.	Perhaps 2 to 6 hours per subject but flexible.	
	Knowledge (G)				
INSTRUCTIONAL PERSONNEL	Equipment (E)			Trained as "Packager" Instructor, both in self-paced Instr. Student-Instr. ratio 4-8.	
	Technique (F)	Men who are judged to be good role models. Student-Instructor ratio 3 to 5.	Men who are judged to be good role models. Student-Instructor ratios 3-5.	Men who are judged to be good role models. Student-Instructor ratios 3-5.	
	Knowledge (G)				
FACILITIES	Equipment (E)			Large room with individual carrels, large lab, with 20 trainers.	
	Technique (F)	Training areas of USAARMS.	Training areas of USAARMS.	Adequate classroom space.	
	Knowledge (G)				
MANAGEMENT CAPABILITY	Equipment (E)			Queues occasionally develop.	
	Technique (F)	Some aspects of individual instruction exist. A good deal of testing.	Some aspects of individual instruction exist. A good deal of testing.	Some aspects of individual instruction exist. A good deal of testing.	
	Knowledge (G)				

PARAMETERS and CONSTRAINTS of Variable (1) TIME CONTEXTS

at the Institution (Fort Knox)

Arising from (factors)	FOCUS	SETTING			
		Operational (A)	Instr, Outdoor (B)	Instr, Indoor (C)	Independent (D)
TASK TYPES	Equipment (E)	Cognitive and perceptual-motor.		Perceptual-motor testing is predominantly hands-on	
	Technique (F)	Perhaps 75% perceptual-motor and 25% cognitive	Cognitive and perceptual-motor	Cognitive and perceptual-motor	
	Knowledge (G)				
LEARNER CHARACTERISTICS	Equipment (E)			Reading grade level 4-6 Some beyond resources of system	
	Technique (F)	Well motivated junior NCO	Well motivated junior NCO	Well motivated junior NCO	
	Knowledge (G)				
(feasible) INSTRUCTIONAL METHODS	Equipment (E)			Self-pacing, contingency management but little selection	
	Technique (F)	Self-pacing already present to an extent. Apparently feasible	Self-pacing already present to an extent. Apparently feasible	Self-pacing already present to an extent. Apparently feasible	
	Knowledge (G)				
MEDIA, MATERIALS, DEVICES	Equipment (E)			No apparent constraints.	
	Technique (F)	Necessary resources are generally available	Necessary resources are generally available	Necessary resources are generally available	
	Knowledge (G)				

PARAMETERS and CONSTRAINTS of TIME CONTEXTS

(a) Fixed at the Institution (Fort Knox)

Arising from (factors)	FOCUS	Operational (a)	Inst, Outdoor (B)	Inst, Indoor (C)	Independent (C)
TIME AVAILABLE	Equipment (E)	---	---	---	---
	Technique (F)	---	Blocks of one-half day or more may be typical	Blocks of one-half day or more may be typical	Not known but some apparently required for subjects continued in other settings
	Knowledge (G)	---	---	---	---
INSTRUCTIONAL PERSONNEL	Equipment (E)	---	---	---	---
	Technique (F)	---	No selection criteria except for master gunners. Student-instructor ratios 3:1	No selection crit. except for master gnrs. Student-instr. ratios may be high as 80	Student-instructor ratios may be as high as 80
	Knowledge (G)	---	---	---	---
FACILITIES	Equipment (E)	---	---	---	---
	Technique (F)	---	Outdoor training areas with elect. power	Classrooms. May be a little cramped.	---
	Knowledge (G)	---	---	---	---
MANAGEMENT CAPABILITY	Equipment (E)	---	---	---	---
	Technique (F)	---	Ind. instr. management capability exists but is limited	Ind. instr. management capability exists but is limited	Ind. instr. management capability exists but is limited
	Knowledge (G)	---	---	---	---

PARAMETERS and CONSTRAINTS
of TIME CONTEXTS

Fixed _____ at the Institution that they ____

Arising from (factors)	FOCUS	SETTING			
		Operational	(a) Inst. Outdoor (b) Test, Index (c) Image Anot (d)		
	Equipment (E)				
USE/ OPER	Technique (F)				
	Knowledge (G)				
	Equipment (E)				
BENEFIT/ CHARACTERISTICS	Technique (F)				
	Knowledge (G)				
	Equipment (E)				
(feasible) INSTRUCTIONAL METHODS	Technique (F)				
	Knowledge (G)				
	Equipment (E)				
MEDIA, MATERIALS, DEVICES	Technique (F)	Resources available but tightly controlled	Resources available but tightly controlled		
	Knowledge (d)				

Part 2

The following tables, B.2.1 and B.2.2, are the result of the reduction of the data presented in Appendix A, Part 2. These tables -- one for variable-time contexts and one for fixed-time contexts -- identify some of the parameters and constraints of the contexts of instruction as they are constituted within Armor units (Fort Carson and Fort Hood).

PARAMETERS and CONSTRAINTS

Table B.2.1

of _____Variable____ (1) TIME CONTEXTS

In the Units (Fort Carson and Fort Hood)

Arising from (factors)	FOCUS	SETTING			
		Operational (A)	Inst., Outdoor (B)	Inst., Indoor (C)	Independent (D)
TIME AVAILABLE	Equipment (E)		8-hour blocks apparently typical		
	Technique (F)	Generally longer blocks of time 1-3 days or as much as a week at a time	3-6 hour blocks. One hour or less at a time also may be typical	One hour to one day at a time	Some time required for subject continued in other setting
	Knowledge (G)				About 3 hours at a time in learning center when personnel are available
INSTRUCTIONAL PERSONNEL	Equipment (E)		Stu-Inst. ratios appear to be quite low, usually about 3, but may be high, perhaps 12 or more		
	Technique (F)	Stu-Inst. ratio about 3-6. Instructors typically have about 2 yrs. exp.	Stu-Inst. ratios vary widely from low of about 4 to perhaps 50	Stu-Inst. ratios could be fairly low typically. Perhaps 3 to about 20.	
	Knowledge (G)				Inst. inexperienced. Stu-Inst. ratio may be about 15
FACILITIES	Equipment (E)		Adequate		
	Technique (F)	Adequate outdoor and tactical areas but all shared	Apparently generally adequate but some inadequate	May be inadequate small classrooms	Study areas may be inadequate
	Knowledge (G)				Learning centers may be inadequate
MANAGEMENT CAPABILITY	Equipment (E)		Apparently some testing but very limited cap. because of maintenance requirements. Testing appears to be irregular. May be every period or never		
	Technique (F)	Apparently some testing after training. Some counseling	Testing appears to be irregular. May be every period or never	Testing appears to be irregular. May be every period or never	Perhaps unit testing
	Knowledge (G)				Testing apparently frequent quick scoring and feedback

PARAMETERS and CONSTRAINTS
of (1) SETTING and (2) TIME CONTEXTS

(B.2.1 continued)
Suitable ___ in the order (first) group and (art flow)

Arising from (Factors)	FOCUS	Operational (A)	Inst., Outdoor (B)	Inst., Indoor (C)	Independent (D)
TASK TYPES	Equipment (E)		Perceptual-motor. Average difficulty to easy. Important. Done daily to weekly		
	Technique (F)	Generally perceptual-motor some cognitive. May be difficult	Generally perceptual-motor some cognitive. Average difficult	Tendency toward cognitive	cognitive, may be difficult
	Knowledge (G)				cognitive and easy. Daily requirement for tasks. Inadequacy serious
LEARNER CHARACTERISTICS	Equipment (E)		Low to average in ability and motivation		
	Technique (F)	Entry level low in ability and motivation. Advanced students high in both	Entry level low in ability and motivation. Advanced students high in both	Entry level low in ability and motivation. Advanced students high in both	May be high in ability and motivation
	Knowledge (G)				Low achievement and motivation. Low language ability
(feasible) INSTRUCTIONAL METHODS	Equipment (E)		Contingency management, small steps, perhaps variable curriculum and adaptive tng.		
	Technique (F)	Contingency management, small steps, adaptive tng. variable curriculum	Contingency management, small steps, adaptive tng.	Contingency management, small steps, perhaps learning of principles.	
	Knowledge (G)				Most methods feasible
INSTRUCTIONAL RESOURCES	Equipment (E)		Tend to be available and operational. Something other than IMs needed		
	Technique (F)	Tend to be available and operational	Devices, equipment, etc. may not be adequately operational	Resources apparently available	Resources apparently available
	Knowledge (G)				Resources lacking

B-9

PARAMETERS and CONSTRAINTS of ___Fixed___ (H) ___TIME CONTEXTS___

Table B. 2.7
In the Units (Fort Carson and Fort Hood)

Arising from (factors)	FOCUS	SETTING				
		Operational	(A)	Inst., Outdoor (B)	Inst., Indoor (C)	Independent (D)
TIME AVAILABLE	Equipment (E)					
	Technique (F)			Perhaps an hour to a day scheduled at a time	8-30 hrs. may be available in 50-min.periods scheduled 2-3 times/week or in blocks	
	Knowledge (G)				1-2 hrs. scheduled as necessary	
INSTRUCTIONAL PERSONNEL	Equipment (E)					
	Technique (F)			Stu.-inst. ratio may be very low, perhaps 2, or quite high, 30 or more	Stu.-inst. ratios about 15-30 with high as 60 possible	
	Knowledge (G)				Stu.-inst. ratio 30-60 One NCO per classroom	
FACILITIES	Equipment (E)					
	Technique (F)			Ranges appear to be adequate	Space tends to be inadequate Shared classrooms, etc.	
	Knowledge (G)				classrooms	
MANAGEMENT CAPABILITY	Equipment (E)					
	Technique (F)			Limited. Perhaps only Informal performance tests	Apparently a considerable amount of testing	
	Knowledge (G)				Only that associated with platform lectures	

(B. 2.2 continued)

PARAMETERS and CONSTRAINTS of ____ (p) TIME CONTEXTS

In the Units (Fort Carson and Fort Hood)

Arising from (factors)	FOCUS	SETTING			
		Operational (A)	Instr, Outdoor (B)	Instr, Indoor (C)	Independent (D)
TASK TYPES	Equipment (E)				
	Technique (F)		Perceptual-motor, some cognitive	Cognitive, perceptual-motor, cognitive probably predominant	
	Knowledge (G)			Cognitive, affective	
LEARNER CHARACTERISTICS	Equipment (E)				
	Technique (F)		Motivation and achievement average to low	Motivation and achievement average to low	
	Knowledge (G)			Low achievement Low motivation	
(feasible) INSTRUCTIONAL METHODS	Equipment (E)				
	Technique (F)		Small steps and perhaps adaptive tng.	Small steps and perhaps adaptive tng. and principles learning	
	Knowledge (G)			Group interaction	
INSTRUCTIONAL RESOURCES	Equipment (E)		Some tng. devices may not be adequately operational	Generally adequate but devices may not be adequately operational	
	Technique (F)				
	Knowledge (G)			Limited except for materials.	

APPENDIX C

Structured Interviews and Observation Instruments

GROUP INTERVIEW

Classification and Definition of Armor Training Environments

1. Explain purpose of study
   - Armor branch plans to continue development of individualized instruction.
   - Need to identify systems of individualized instruction that are appropriate for Armor training.
   - Thus, need to classify and describe Armor training environments (contexts) in effort to determine what kinds of individualized instruction are appropriate for them.

2. Explain that immediate task is to classify Armor training environments in which the training of this unit is conducted.

3. Develop concept of classification system through following illustrations and questions:

   a. Sgt. Brown at Ft. Knox has a shop (a classroom) in which he teaches automotive maintenance. He has 10 hours to teach an AIT module. He has the equipment he needs, including parts of tanks, devices, simulators, etc.

      Question 1: Would you say that, in a general way, these conditions describe Sgt. Brown's training environment?

   b. Sgt. Jones at Ft. Hood has a shop (a classroom) in which he teaches automotive maintenance. He has the equipment he needs, including parts of tanks, devices, simulators, etc. He also teaches an AIT module, but he doesn't worry about time, if he needs 20 hours to complete his module, he can get 20 hours.

      Question 2: Is Sgt. Jones' training environment different from Sgt. Brown's? How?

   c. Sgt. Williams at Ft. Carson has a classroom in which he teaches gunnery. He has GTA's devices and other training aids. He has 20 hours to teach an AIT module, no more.

      Question 3: Is Sgt. William's training environment the same as either Sgt. Brown's environment or Sgt. Jones' environment?

4. Distribute matrix figure.

      Question 4: Does this illustrate what we have been talking about?

C-2

GROUP INTERVIEW (continued)

5. If answers to above questions generally indicate understanding and acceptance of classification system, proceed with classification of unit contexts. If not, attempt to modify system to gain understanding and acceptance. If this fails, abandon attempt to have respondents participate in classification.

6. Explain classification of three contexts above by means of matrix

    a. – setting   :   instructional indoor
        – focus   :   equipment
        – time   :   fixed
    b. – setting   :   instructional indoor
        – focus   :   equipment
        – time   :   variable
    c. – setting   :   instructional indoor
        – focus   :   technique
        – time   :   fixed

7. Use matrix to classify training environments of this unit. (Record on data sheets and questionnaires.)

8. On basis of discussion of classification of training environment (contexts), identify individuals who appear to be most knowledgeable about them and ask these persons to complete the questionnaire after the interview.

9. Conclude interview.

10. Administer questionnaire.

Time

Variable (b)

Fixed (a)

(c) (Other)

Focus (2)

(b) Technique

(a) Equipment

(a) Operational

(b) Instructional-Outdoor

(c) Instructional-Indoor

Setting (1)

(d) Independent

(e) (Other)

Classification Matrix

C-4
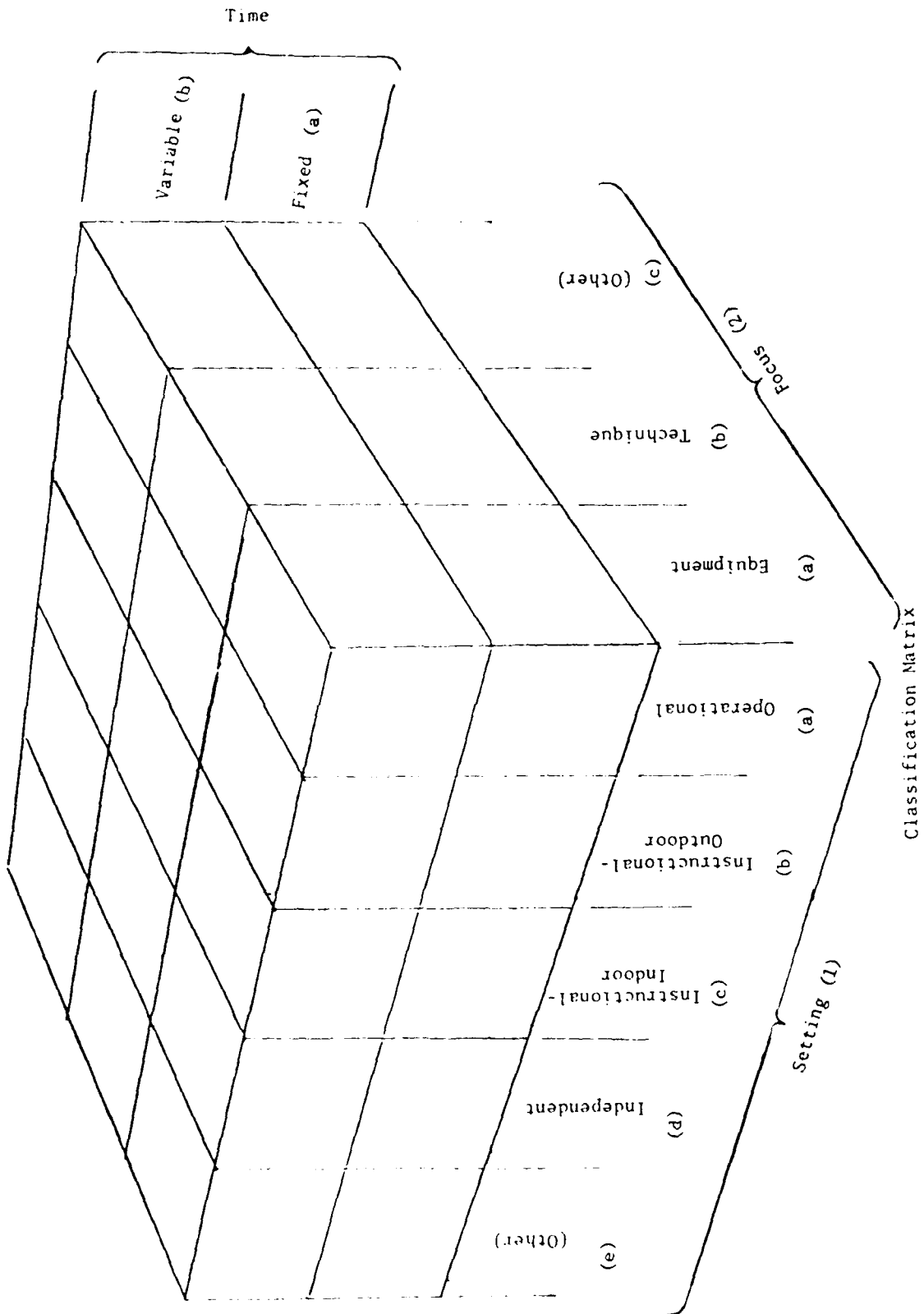
INTERVIEW DATA SHEET

Unit _____ Date _____

Classification and Definition of Armor Training Environments (Contents)

I. Classification of a training environment

    A. Task(s)/Subject(s) _____

          1. setting _____

          2. focus _____

          3. time _____

    B. Classification code _____

II. Anecdotal material _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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OBSERVATION DATA SHEET

Unit _____ Date _____

Classification and Definition of Armor Training Environments (Contexts)

I. Classification of training environment

    A. Task(s)/Subject(s) _____

            1. setting _____

            2. focus _____

            3. time _____

    b. Classification code _____

II. Observational/Anecdotal by Factor

    A. Available time _____

    _____

    _____

    _____

    _____

    B. Instructional personnel _____

    _____

    _____

    _____

    _____

    C. Facilities _____

    _____

    _____

    _____

D. Management capability _____

_____

_____

_____

E. Task types _____

_____

_____

_____

F. Learner characteristics _____

_____

_____

_____

G. Feasible instructional methods _____

_____

_____

_____

H. Instructional resources _____

_____

_____

_____

APPENDIX D

Questionnaire

QUESTIONNAIRE

Classification and Definition of Armor Training Environment
(Instructional Contexts)

Introduction

The purpose of this questionnaire is to obtain descriptive information about current Armor training environments (or instructional contexts). Once this information has been gathered, it will be possible to decide which of the many types of individualized instruction are appropriate for Armor training environments.

This questionnaire contains questions about eight (8) factors thought to be influential in determining the nature of training environments. As you answer the questions under each factor, consider how that factor influences the training environment identified below.

Your answers should be based on how Armor training is now conducted in the training environment identified below.

Thank you for your help.

TRAINING ENVIRONMENT

Task(s)/Subject(s) _____

Setting _____

Focus _____

Time _____

Factor 1: Available Time

1.1 How much total time (hours) is now available for training the
     above task(s)/subject(s) in this training environment?   _____ hours

1.2 How long are the periods of instruction?   _____ minutes

1.3 How are the periods scheduled? (Check one)

     ☐ Consecutively (a solid block of time)

     ☐ Every work day

     ☐ Two or three times a week

     ☐ Weekly

     ☐ Other. Specify: _____

1.4 Would it be possilbe to conduct self-paced instruction within the
     overall time available for training in the task(s)/subject(s)?
     (Check one.)

                    ☐ Yes   ☐ No

1.5 If no, please briefly explain why not. _____

     _____

     _____

     _____

1.6 What major breaks in instruction usually occur during this training?
     (Check all that apply)
     ☐ Holiday or other leave (a week or more)

     ☐ TDY of several days or more

     ☐ Holidays or special events of one or two days.

     ☐ None.

Factor 2: Instructional Personnel

2.1 How much experience in the task(s)/subject(s) do instructors usually
     have before becoming instructors?   _____ years

D-3

2.2   How much experience/training has the typical instructor had with
        individualized instruction?   (Check one)

        ☐   A lot. (Has been an instructor in an individualized situation.)

        ☐   Some. (Has had some training or experience in the methods of
            individualized instruction or has taken some training in
            individualized situations.)

        ☐   None.

2.3   How much training has the typical instructor in this environment had
        in traditional ("lock-step") instruction? (Check one)

        ☐   A lot. (Has had formal training in a course or school.)

        ☐   Some. (Has been trained on the job by his peers.)

        ☐   None.

2.4   How often do instructors in this environment substitute for or do
        the work of other instructors? (Check one)

        ☐   Frequently

        ☐   Occasionally

        ☐   Seldom

        ☐   Never

2.5   What is the usual ratio of instructional personnel to trainees in
        this environment. (Fill in)

        One instructor for every _____ trainees.
        (If the ratio varies from one phase of instruction to another, please
        explain briefly: _____

        _____ _____

        _____)

                          Factor 3:   Facilities

3.1   How adequate for present training activities is the space available
        in this training environment? (Check one)

        ☐   More than adequate (Not all the available space is actually used.)

        ☐   Adequate (There is enough but there is none that is not used.)

        ☐   Inadequate (Needed space is not always available.)

3.2 How many different instructional areas or facilities are now available (whether used or not) for the training in the above task(s)/subject(s)? If you are not sure, your best guess will be appreciated. Please tally below in left-hand column.

Number Available	Instructional/training area or facility	✓
	Small classroom(s) (30-40 seats)	
	Large classroom(s) (more than 40 seats)	
	Lab(s), shop(s), or simulator area(s)	
	Independent study area(s)	
	Outdoor training area(s) (with or without bleachers, etc.)	
	Tactical training area(s)	
	Other. Describe:	

3.3 Which of the areas or facilities now available for training in the above task(s)/subject(s) are also used for other training activities (other courses or subjects with different instructors)? Please indicate with a check in the right hand column in Item 3.2 above.

Factor 4: Management Capability

4.1 About how frequently are tests given during the instruction in this environment? (Check one)

☐ At least once every instructional period.

☐ At least every two or three instructional periods.

☐ Only at the end of units or modules.

☐ Only at the end of the training or never.

4.2 How soon are tests usually scored and trainees informed of results? (Check one)

☐ Immediately

☐ During the period of instruction in which the test was taken.

☐ Within two or three days.

☐ After three or more days.

D-5

4.3 For what purpose are tests most commonly used? (Check one)

☐ To identify both what the trainee has learned/needs to learn and problems in the training system.

☐ To identify what the trainee has learned/needs to learn.

☐ Only to give the trainee a GO - NO GO or some other form of grade.

☐ Other. Please describe briefly: _____

4.4 Under what conditions will one instructor do or assist with another instructor's job? (Check one)

☐ Any time he sees or becomes aware of a problem that needs immediate attention.

☐ Any time another instructor asks for help.

☐ When the chief or senior instructor tells him to.

☐ Other. Please describe briefly: _____

4.5 To what extent are individual trainees counseled on their progress or lack of it? (Check one)

☐ Each trainee is regularly counseled.

☐ Trainees with problems are counseled when they need counseling.

☐ Individual trainees are ordinarily not counseled.

☐ Other. Please describe briefly: _____

Factor 5: Task Types

5.1 What kind of tasks are usually taught in this training environment? (Check only one, but if you disagree with the categories briefly explain below.)

☐ Motor tasks (Done essentially with the hands or body.)

☐ Perceptual tasks (Done mostly by seeing, hearing, touching, etc.)

☐ Perceptual/motor tasks (Done essentially with hands or body in coordination with seeing, hearing, touching, etc.)

☐ Cognitive tasks (Primarily mental tasks.)

Disagreement: _____

D-6

5.2   How difficult are the tasks taught in this environment? (Check one)

☐   Very difficult

☐   Difficult

☐   Of average difficulty

☐   Easy

☐   Very easy

5.3   How important are the tasks taught in this environment to mission performance? (Check one)

☐   Very important

☐   Important

☐   Of average importance

☐   Of questionable importance

☐   Unimportant

5.4   How frequently are the tasks taught in this environment performed on the job? (Check one that comes closest.)

☐   Hourly

☐   Daily

☐   Weekly

☐   Monthly

☐   Annually

5.5   How serious would the consequences be if the tasks taught in this environment were inadequately performed? (Check one)

☐   Very serious

☐   Serious

☐   Not serious

Factor 6: Learner Characteristics

6.1 How would you rate the students who are trained in this environment in terms of:

		High	Average	Low
6.1.1	Prior military achievement?	☐	☐	☐
6.1.2	Prior civilian achievement?	☐	☐	☐
6.1.3	Motivation?	☐	☐	☐

6.2 How long has the typical student in this training environment been assigned to this MOS? _____ months

6.3 How long has the typical student in this training environment been in the service? _____ months

6.4 How would you rate the typical student's:

		High	Average	Low
6.4.1	Reading ability?	☐	☐	☐
6.4.2	Motor ability?	☐	☐	☐
6.4.3	Language ability?	☐	☐	☐

6.5 How many different jobs has the typical student previously held in his MOS? _____

Factor 7: Feasible Instructional Methods

Some general methods, models, or strategies of instruction are probably more feasible for this training environment than others. Several such methods, models, or strategies are very briefly described below. Please rate the feasibility of each for this training environment on the basis of your own experience and beliefs.

7.1 Contingency/reinforcement management. If the trainee wants certain rewards -- such as special recognition, choice of assignments, extended breaks, promotion, etc. -- he must perform in certain ways. That is, he must learn fast, learn precisely, obey rules, etc.
(Check one)

☐ Completely feasible ☐ Limited feasibility ☐ Not feasible

D-8

7.2 <u>Small steps with immediate feedback/positive reinforcement</u>. The content of instruction is broken down into very small steps, and each time a trainee completes or attempts a step he receives immediate knowledge of results and reinforcement if his response is correct (an example is a programmed text). (Check one)

☐ Completely feasible   ☐ Limited feasibility   ☐ Not feasible

7.3 <u>Adaptive training model</u>. The difficulty or complexity of a task is adjusted to individual skill levels; as training progresses and the trainee learns, the difficulty of the task increases. (Check one)

☐ Completely feasible   ☐ Limited feasibility   ☐ Not feasible

7.4 <u>Variable curriculum - variable time - variable standards model</u>. Because not all trainees can learn the same things to the same standards in the same times, content (curriculum), time to learn, or standards are varied to meet individual needs. For example, Trainee A might study the same content in the same time as Trainee B, but he would not be required to meet the same standards. (Check one)

☐ Completely feasible   ☐ Limited feasibility   ☐ Not feasible

7.5 <u>Learner — centered instruction</u>. Objectives and perhaps time to learn are given, but the individual trainee is free to decide how he will learn. (Check one)

☐ Completely feasible   ☐ Limited feasibility   ☐ Not feasible

7.6 <u>Principles learning</u>. Instead of learning rules or procedures, the trainee learns the principles underlying the rules or procedures so that he can figure out the rules or procedures for himself. (Check one)

☐ Completely feasible   ☐ Limited feasibility   ☐ Not feasible

Comment: _____

_____

_____

_____

_____

D-9

Factor 8: Instructional Resources

8.1 Does this training environment contain needed instructional resources, such as manuals, devices, simulators, and equipment? (Check one)

Yes ☐   No ☐

8.2 Are additional resources available if needed?   (Check one)

Yes ☐   No ☐

8.3 Are devices, simulators, items of equipment, etc., adequately operational?   (Check one)

Yes ☐   No ☐

End of Questionnaire. Thanks again!

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